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# ANNALS OF SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

EDITED BY  
**LEWIS STEPHEN PILCHER, M.D., LL.D.,**  
OF NEW YORK.

WITH THE COLLABORATION OF

J. WILLIAM WHITE, M.D., LL.D., OF PHILADELPHIA, Professor of Surgery in the University of Pennsylvania.	SIR WILLIAM MACEWEN, M.D., LL.D. OF GLASGOW, Professor of Surgery in the University of Glasgow.
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SIR W. WATSON CHEYNE, C.B., F.R.S.,  
OF LONDON,  
Professor of Surgery in King's College.

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## CONTRIBUTORS TO VOLUME LIX.

- ALLEN, FRANCIS OLcott, JR., M.D., of Philadelphia, Pa.
- ARMSTRONG, GEORGE E., M.D., of Montreal, Professor of Surgery in McGill University.
- BALFOUR, DONALD C., M.D., of Rochester, Minnesota.
- BARNES, ALLAN F., M.D., of Cambridge, Mass., Visiting Surgeon to the Cambridge Hospital.
- BECK, EMIL G., M.D., of Chicago, Ill., Surgeon to the North Chicago Hospital.
- BECKMAN, E. H., M.D., of Rochester, Minn.
- BERNHEIM, BERTRAM M., M.D., of Baltimore, Md.
- BROWN, ALFRED T., M.D., of New York City, Adjunct Assistant Attending Surgeon, First Division, Bellevue Hospital; Instructor in Anatomy, Columbia University.
- BULKLEY, KENNETH, M.D., of New York.
- BURNHAM, A. CAMPBELL, M.D., of New York City.
- CLARK, H. C., M.D., of Ancon, Canal Zone.
- CLARK, J. BAYARD, M.D., of New York City, Assistant Genito-Urinary Surgeon, Bellevue Hospital.
- COLE, ALBERT M., M.D., of Indianapolis, Indiana.
- CUMSTON, CHARLES GREENE, M.D., of Geneva, Switzerland, Privat-docent at the Faculty of Medicine.
- DA COSTA, JOHN CHALMERS, M.D., of Philadelphia, Pa., Samuel D. Gross Professor of Surgery in Jefferson Medical College.
- DANDY, WALTER E., M.D., of Baltimore.
- DEAVER, JOHN B., M.D., of Philadelphia, Surgeon-in-Chief to the German Hospital.
- DELATOUR, H. BEECKMAN, M.D., of Brooklyn, N. Y., Surgeon to the Norwegian and to St. John's Hospitals.
- EASTMAN, JOSEPH RILUS, M.D., of Indianapolis, Indiana.
- ELIOT, ELLSWORTH, JR., M.D., of New York, Surgeon to the Presbyterian Hospital.

- EWING, EPHRAIM M., Sc.D., of New York.
- FLAHERTY, FREDERICK, M.D., of Syracuse, N. Y., Professor of Clinical Surgery in Syracuse University.
- FOSTER, NELLIS B., M.D., of New York.
- GAILLARD, A. THEODORE, M.D., of Philadelphia, Pa.
- GIBSON, CHARLES, M.D., of New York, Surgeon to the First (Cornell Medical College) Surgical Division of the New York Hospital.
- GREEN, NATHAN W., M.D., of New York, Attending Surgeon, City Hospital; Assistant Attending Surgeon, St. Luke's Hospital.
- HAMANN, CARL A., M.D., of Cleveland, Ohio, Professor of Applied Anatomy and Clinical Surgery, Western Reserve University.
- HARTMANN, HENRI, M.D., of Paris.
- HENDERSON, M. S., M.B.(Tor.), of Rochester, Minn.
- HERRICK, FREDERICK C., M.D., of Cleveland, Ohio, Associate in Surgery in the Western Reserve University.
- HUNTINGTON, THOMAS W., M.D., of San Francisco, Cal., Professor of Surgery in the University of California.
- HYMAN, A., M.D., of New York City, Adjunct Surgeon to Lebanon Hospital; Chief of Genito-Urinary Clinic, Mt. Sinai Hospital Dispensary.
- JANEWAY, HENRY H., M.D., of New York.
- JUDD, EDWIN STARR, M.D., of Rochester, Minnesota.
- LAMBERT, ADRIAN V. S., M.D., of New York.
- LAMSON, O. F., M.D., of Seattle, Wash.
- LILIENTHAL, HOWARD, M.D., of New York City, Surgeon to Mt. Sinai and Bellevue Hospitals.
- LOTHROP, HOWARD A., M.D., of Boston, Mass., Visiting Surgeon, Boston City Hospital; Assistant Professor of Surgery in the Harvard Medical School.
- LOWER, W. E., M.D., of Cleveland, Ohio.
- MARTIN, FRANK, M.D., of Baltimore, Md., Professor of Operative Surgery and Clinical Surgery in the University of Maryland.
- MAYO, CHARLES H., M.D., of Rochester, Minn.
- MAYO, WILLIAM J., M.D., of Rochester, Minnesota.
- McGRATH, BERNARD FRANCIS, M.D., of Rochester, Minnesota.

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v

MCLEAN, ANGUS, M.D., of Detroit, Mich.

MCKWILLIAMS, CLARENCE A., M.D., of New York, Assistant Surgeon, Presbyterian Hospital.

MENCKE, J. BERNHARD, M.D., of Philadelphia, Assistant Surgeon to the Out-Patient Department of the German Hospital; Assistant Surgeon to the Stetson Hospital.

MOSCHCOWITZ, ALEXIS V., of New York, Visiting Surgeon, Har Moriah Hospital; Associate Surgeon, Mount Sinai Hospital.

NICOLAYSEN, JOHAN, M.D., of Christiania, Norway, Professor of Clinical Surgery at the University of Christiania.

NYULASY, ARTHUR J., M.R.C.S. (Eng.), of Perth, Western Australia, Gynaecologist to the Perth Hospital.

OWEN, HUBLEY R., M.D., of Philadelphia, Pa., Surgeon to the Philadelphia General Hospital; Assistant Surgeon to the Orthopædic and Stetson Hospitals.

PACKARD, HORACE, M.D., of Boston, Mass., Professor of Surgery, Boston University.

PFEIFFER, DAMON B., M.D., of Philadelphia, Pa.

PILCHER, LEWIS STEPHEN, M.D., of Brooklyn, N. Y.

PILCHER, PAUL MONROE, M.D., of Brooklyn, New York.

POPE, SAXTON, M.D., of San Francisco, Cal., Instructor in Surgery in the University of California.

POWERS, CHARLES A., M.D., of Denver, Colo., Professor of Clinical Surgery in the University of Colorado.

PROUST, ROBERT, M.D., of Paris, France.

ROBINSON, ERNEST F., M.D., of Kansas City, Mo.

RECKEY, A. E., M.D., of Portland, Oregon.

RODMAN, WILLIAM L., M.D., of Philadelphia, Professor of Surgery in the Medico-Chirurgical College; Surgeon to Presbyterian and Blockley Hospitals.

ROGERS, JOHN, M.D., of New York, Surgeon to Bellevue and St. Francis Hospitals.

ROWNTREE, L. G., M.D., of Baltimore.

RUGH, J. TORRANCE, M.D., of Philadelphia, Pa.

SCUDDER, CHARLES L., M.D., of Boston, Mass., Surgeon to the Massachusetts General Hospital; Associate in Surgery, Harvard University.

- SHOEMAKER, GEO. ERETY, M.D., of Philadelphia, Gynecologist to the Presbyterian Hospital.
- SPEESE, JOHN, M.D., of Philadelphia, Pa., Instructor in Surgery and Surgical Pathology, University of Pennsylvania.
- SQUIER, J. BENTLEY, M.D., of New York, Director of Genito-Urinary Department, New York Post-Graduate Hospital.
- STEWART, FRANCIS T., M.D., of Philadelphia, Professor of Clinical Surgery in Jefferson Medical College.
- STONE, HARVEY B., M.D., of Baltimore, Md.
- SUMMERS, JOHN E., M.D., of Omaha, Neb.
- THOMAS, T. TURNER, M.D., of Philadelphia.
- THOMPSON, JAMES E., M.D., of Galveston, Texas.
- TIRUMURTI, T. S., M.B. and C.M., of Madras, India, Assistant Professor of Pathology in the Madras Medical College.
- WADE, HENRY, M.D., F.R.C.S. (Ed.), of Edinburgh, Lecturer in Surgery, Surgeons' Hall of Edinburgh; Assistant Surgeon, Edinburgh Royal Infirmary and Leith Hospital.
- WHIPPLE, G. H., M.D., of Baltimore, Md.
- WIENER, JOSEPH, M.D., of New York City, Associate Surgeon, Mt. Sinai Hospital.
- WILENSKY, ABRAHAM O., M.D., of New York, Attending Surgeon, Mount Sinai Hospital Dispensary; Adjunct Attending Surgeon, Bronx Hospital and Dispensary.
- WILLIAMS, R. BLAND, M.D., of the U. S. Navy, Surgeon, U. S. Naval Hospital, Brooklyn, N. Y.
- WROTH, PEREGRINE, JR., M.D., of Hagerstown, Md.

# ANNALS OF SURGERY

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## ORIGINAL MEMOIRS.

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### A FURTHER CONTRIBUTION TO THE STUDY OF PERICOLIC MEMBRANOUS FILMS AND BANDS.

BY LEWIS STEPHEN PILCHER, M.D.,  
OF BROOKLYN, N. Y.

IN a paper which was published in the ANNALS OF SURGERY, for January, 1912, after a study of a limited number of cases which had been observed by me personally, and a review of the literature of the subject, I formulated the conclusion that right-sided pericolic adhesions and membraniform veils and bands formed a fairly distinct pathologic entity deserving recognition as a well-defined surgical condition. As to the etiology of these films and bands, it seemed to me most probable that they were the result of long-continued or oft-repeated mild infections of the peritoneal covering of the caecum and appendix transmitted through the intestinal wall. Since that paper was written, I have had an opportunity to observe additional cases, and it is upon the facts elicited in these cases that I wish to base some further observations. In the period of time that has elapsed since the publication of my paper, there have also been published a number of important contributions upon the subject, including papers by William J. Mayo, F. G. Connell, Joseph R. Eastman, Jabez N. Jackson, Isaacs, Coffey, Flint, and others. In my first paper, in giving credit to those who had contributed to the development of knowledge upon the subject, I was unfortunate enough to have overlooked the observations published in 1905 by Professor Binnie, of Kansas City, in which, under the name of pericolitis dextra, the condition now

under consideration was for the first time very clearly described.

In all of these contributions the question of the etiology of these membraniform conditions has received attention. Special importance must be attached to the observations of Professor Flint, made in a series of human embryos and of two infants at term. His conclusion is that they are not the products of inflammation nor are they due to the burrowing of the cæcum behind the parietal peritoneum. In his view they represent simply a more marked attachment of the large intestine to the posterior abdominal wall, or in some cases the more extensive fusion of the omentum to the colon, which is dragged down with the descent of the cæcum and gives it an attachment on the colon continuous with an embryonic membrane. He further concludes that the condition is much more frequent than we have suspected; that in many instances it produces no inconvenience; that it is only after the super-vention of other causes, as ptoses or inflammatory conditions, that they become a source of disturbance and discomfort.

The observations of Professor Flint are of sufficient importance to stimulate investigators, especially those who have the control of material involving embryos or new-born children, to specially examine with reference to this condition. Along this same line are to be noted the observations of Dr. Joseph Rilus Eastman, who found in 5 out of 28 foetus a condition described as a peritoneal fold arising from the left or inner side of the ascending colon which passed over the anterior aspect of the ascending colon in an upward slanting direction to be attached to the parietal peritoneum at the right of the ascending colon. This fold may adhere to the anterior and lateral aspects of the colon. These folds exist before birth and are readily demonstrable in one form or another, according to Eastman, in approximately 20 per cent. of foetus after the sixth month. Dr. Eastman, however, is careful to note that not all anomalous membranes which have been designated as Jackson's membranes are fetal structures, but expresses the opinion that mechanical irritations and long-continued and oft-repeated mild infections of the peritoneal

covering of the cæcum and appendix fit in well with the explanation of the embryonal origin of these membranes, since their fusions, adhesions, and contractures are doubtless directly or indirectly due to inflammation, so that the final solution of the problem of the origin of the conditions known as Lane's kink and Jackson's membrane will properly be represented by the sum of the views of various observers.

My original paper was based upon a study of six cases in which membranous formations, covering in varying degrees some part of the colon, and crippling its function more or less, were found present when the parts were exposed by abdominal section. For the purposes of an orderly and complete presentation of the material thus far accumulated, I will here give a condensed abstract of these cases as follows:

**CASE I.**—A woman over forty years of age, the onset of whose symptoms dated back only three months from the day when operation showed her to be the subject of a chronic appendicitis and membranous pericolitis. A right-sided perinephritic infection complicated this case, which was most plausibly explained as due to infection carried by the lymphatic paths from the region of the cæcum and ascending colon.

**CASE II.**—A woman twenty-four years of age, who in addition to a definite membranous film covering the cæcum and ascending colon was the subject of chronic appendicitis, chronic salpingitis, and chronic ovaritis.

**CASE III.**—A man, thirty-seven years of age, who as a youth or young man had enjoyed good health and displayed more than the average activity and energy in his work. When he was thirty-two years of age, an acute appendical attack ushered in the symptoms of right-sided disturbance, which were not relieved by the removal of the appendix, and persisted for five years, until he came to operation.

**CASE IV.**—Patient was a large, athletic, and finely developed man, who had always pursued an outdoor occupation. At the age of twenty-seven he developed an acute appendicitis, for which he was operated upon, making an apparently uncomplicated recovery. From that time, however, began a train of symptoms running through a period of seven years until he finally came to operation

at our hands, when there was found to be present a double-barrelled shotgun arrangement of the colon, the elements of which were bound together by a membranous envelope to which were added strong lateral bands confining the mass to the lateral parieties.

CASE V.—A lady thirty-two years of age, who, when she was twenty-eight years of age, first began to suffer from pain in the right iliac fossa. After a year of suffering her appendix was removed and she made a good operative recovery. Nevertheless her right-sided pains continued. In this case at operation the cæcum and ileum were found to be bound together, and the ascending colon to be constricted by distinct bands which were parts of a general membranous film covering in the ascending colon.

CASE VI.—A woman fifty-one years of age, who had long been an ailing neurasthenic woman. It had been recognized that she was suffering from certain positive pelvic conditions, but after these were corrected by proper measures she continued to ail. Her appendix had not been removed. It was found, however, when exposed at operation to be the seat of a long-standing chronic inflammatory process, associated with membranous bands, which not only bound it to the cæcum and adjacent ileum but were also continuous as membranous films which bound together the ascending and first portion of the transverse colon as two barrels of a double-barrelled shotgun (cf. Case IV).

These cases constituted the sum of our experience up to October, 1911. In the period of time which has since elapsed the number of these special cases has considerably increased, partly, perhaps, because we are looking for them and have learned to recognize them. The number, however, is not yet so great but that the recital and analysis of individual cases is still important. Up to the end of the present hospital year terminating March 31, 1913, these additional cases number nineteen in all. The following is a somewhat full abstract of their several histories and the pathological findings.

CASE VII.—*Right-sided pericolic bands not causing symptoms; constriction of colon distal to splenic flexure by band formed by adherent epiploic appendage.* (Hospital No. 233.)

Male, seventy-five years of age. Had been a hale, vigorous, and active man. Four years ago he had an acute digestive disturbance accompanied with vomiting and purging. Two years later he began to experience in the splenic region a vague sense of discomfort which has continued to the present time. At irregular intervals there would be exacerbations of pain with an accumulation of flatus in the colon and constipation, culminating in a diarrhoeal attack after which relief would follow for an indefinite time.

During the month immediately previous to coming under our care this condition of intestinal irregularity had been quite marked. All his trouble subjectively was localized in the region of the splenic flexure. The tendency to constipation was marked. When cathartics were taken and these were effectual in moving the bowels, relief to his subjective symptoms followed for the time being. Abdominal palpation was negative with the exception that there was a fixed point of moderate tenderness on the outer margin of the left rectus muscle half way between the umbilicus and the costal arch. A series of bismuth skiagraphs demonstrated an obstruction at the splenic flexure.

On November 16, 1911, the abdomen was opened by a five-inch longitudinal incision through the left rectus muscle from the costal margin downward. The transverse colon was exposed and traced to the splenic flexure. Just below the splenic flexure was brought into view a half inch wide band, encircling and constricting the intestine to such a degree that when a moderate angulation was added gas would not pass. Further examination showed this constricting band to have been formed by an epiploic appendage, the tip of which had been carried over the intestine and become adherent to the mesocolon in such a manner as to constrict the intestine. When this was divided and its ends reflected to either side the bowel at once ballooned out and all signs of obstruction disappeared. Further exploration downward along the sigmoid flexure was negative. In the right iliac fossa, which was explored by the hand introduced through the wound, pericolitic bands could be felt, but since these had not given rise to any symptoms, it was not deemed wise at that time to expose the aged patient to the dangers of the more prolonged operative proceedings which would be demanded for exposing and dividing them. Most notable, however, was the condition of

the peritoneal layer of the transverse colon from the point of constriction backward. Its surface was congested and was somewhat rough and granular in appearance, and at points presented a filmy deposit. To the mind of the observers the condition was strongly suggestive of the early stages of the formation of the more extensive well-developed, membranous films which had been demonstrated to be present on the right side. This reddened and granular condition of the peritoneum of the transverse colon was unquestionably a result secondary to the presence of the obstructing band near the splenic flexure. The adhesion of the tip of the epiploic appendage was itself an unmistakable evidence of the presence at a previous time in this locality of an acute infectious process.

Two years have now elapsed since this operation, and the patient has remained in vigorous health, free from his old obstructive symptoms.

CASE VIII.—*Posttyphoidal diffuse adhesive peritonitis; widespread intra-abdominal adhesions and pericolic films; chronic appendicitis; ileac kink; relief by separation of adhesions and removal of diseased appendix.* (Hospital No. 240.)

Male, thirty-seven years of age. A thick-set, neurotic man with tendency to obesity. Seven years ago had typhoid fever, which ran a course of seven weeks. Three years ago was confined for ten days by an attack, the chief element of which was pain referred to the right side of his abdomen. This gradually disappeared in its acuteness, but ever since that time he has had pain at irregular intervals referred to the same region. Four months ago he had an attack more aggravated than usual, which lasted for two weeks. His bowels are constipated, and whenever he is tired or has been exposed, he suffers from colicky pains in them. He also is subject to attacks of spasmodic pain referred to the pylorus. These attacks of pain are always preceded by a condition of constipation and are relieved when the bowels move. There is tenderness on pressure over the region of the appendix, which tenderness extends downward into the pelvis. There is some tenderness complained of over the pylorus.

*Operation* (December 7, 1911).—A four-inch oblique incision rather high in the right iliac region. When the abdominal wall had been divided no free peritoneal cavity was entered, but the subjacent intestines everywhere were found adherent to the parietal peritoneal surfaces. An entry, however, was effected between

the coils of intestine exposed by the incision, and these coils were drawn apart by dividing the delicate adhesive films connecting them until the ascending colon and the cæcum with the appendix were eventually liberated and uncovered. All these structures and the adjoining coils of small intestine and the parietal peritoneum were bound together by delicate but firm adhesive films, and the whole area presented many tortuous dilated capillaries. The appendix when identified was found passing downward and backward underneath the ileum and thence to the pelvis below, and was bound throughout its whole extent to the ileum by an adhesion film. It was the subject of a chronic inflammatory thickening. It was enucleated and removed in the usual manner. The ascending colon was traced up to the hepatic flexure, and the restraining film in a large degree removed from its surface. At this point operative interference was suspended and after toilet of the region had been made with haemostasis wound was closed. Operative recovery was uncomplicated. Ultimate result, entire relief from the symptoms for which the operation had been performed. The patient's condition was unmistakably the product of acute local inflammatory attacks, the previous symptoms of which as detailed in his history are clear enough and are doubtless due to bowel changes consequent upon the typhoid ulcers when thirty years of age. To the eye of the operator many of the filmy areas exposed in this case were identical in appearance with those which he had seen in the other and less severe cases of pericolitis.

CASE IX.—*Definite pericolic membrane covering in the ascending colon, reflected from lateral parietes, with strong band-like process extending up to gall-bladder and right hypochondrium; appendix chronically inflamed, sharply angulated and bound to cæcum and adjacent ileum by strong band-like adhesions which kinked the ileum.* (Hospital No. 261.)

Female, thirty-two years of age. A neurotic young woman well nourished, who since she was eight years of age has been the subject of a series of digestive troubles. Throughout her history there has been a marked tendency to constipation. At the age of nineteen, 13 years ago, she had an attack of severe pain referred to the upper abdomen, which lasted for three or four hours and was followed by a sense of epigastric tenderness for several days. Two years later she had a similar attack. Seven years later she

had a much more severe attack. These attacks never were accompanied with jaundice. Since this last attack four years ago she has been very easily exhausted. Bowels have been markedly irregular. Six months ago had a transient attack of pain in the region of the appendix, which lasted for one week. Since that time she has had numerous similar but slighter attacks. During the four weeks previous to coming under our observation she had had continuous pain low down in the right iliac fossa. Examination elicited nothing in the pelvis nor in the epigastrium, but there was a general tenderness over the line of the ascending colon, with its maximum over the appendix.

*Operation* (January 20, 1912).—The abdomen was opened by a five-inch longitudinal incision through the right rectus muscle with its centre opposite the umbilicus. The gall-bladder upon exposure appeared normal, but there extended from it to the hepatic flexure of the colon a rather long, dense band of adhesion. After this band had been divided the exposed ascending colon was found to be covered by a rather thick membranous veil of adhesion binding it to the lateral abdominal wall. Running in this veil were many small venules. This veil was stripped off until the entire ascending colon was free. The wall of the cæcum was thickened but not covered by this membranous veil. The appendix was sharply angulated and confined by a short, thick meso-appendix, which was bound in with the head of the cæcum and the adjacent portion of the ileum by a fibrous band-like formation which constricted and angulated the ileum. These various structures were freed from each other, and the appendix removed. The appendix was found to be in a state of chronic inflammatory thickening. The operative recovery in this case was uncomplicated, and the specific relief from the symptoms from which she had suffered was very marked.

CASE X.—*Vascular membraniform veil springing from right lateral parietes reflected over ascending colon; upper portion thickened into a distinct band constricting colon at hepatic flexure; chronic appendicitis; ileac kink.* (Hospital No. 267.)

Male, twenty-one years of age. An active, athletic young man always enjoying good health until six months ago, when he took part in a long distance running race. He finished the race but was so exhausted by the effort that he was confined to his bed for a week thereafter. Since that time he has been subject to frequent

colicky pains referred to the right hypochondrium, coming on an hour or so after eating. There was a tendency to constipation of the bowels, but he has been able to accomplish a daily stool. He now complains of slight tenderness over the appendix and of discomfort in the right iliac fossa at times, especially after exertion. Examination shows a marked rigidity of the right lower rectus muscle with some tumefaction in the region of the cæcum and ascending colon, with tenderness upon pressure.

*Operation* (February 28, 1912).—Usual three-inch longitudinal incision along the outer border of the right rectus muscle. The ascending colon when exposed was found covered by a membraniform veil springing from the lateral parietes and reflected over the ascending colon from the hepatic flexure down to the cæcum, but not covering the cæcum. This veil was quite vascular, and at its upper portion was so thickened that it formed a distinct band which immobilized the colon and constricted decidedly the intestinal lumen at that point. The appendix was, however, thickened and congested by chronic inflammation. The meso-appendix was thickened and from it extended a thick fibrous band which bound the appendix, cæcum, and ileum to the margin of the pelvic brim. When this band was divided the whole cæcum was found to be freely movable. The mobility of the cæcum was still more accentuated when the upper membranous veil had been divided and stripped off. The raw surfaces left by the separation of the adhesions and the division of the bands were covered in by proper sutures as far as possible, the parts placed in the normal relations, and the wound closed. Operative recovery was uncomplicated. The ultimate result was an entire removal of the discomfort and disability for which the operation had been performed.

*CASE XI.—Colonoptosis; ascending colon at middle encircled and constricted by membraniform band; cæcum dilated and mobile; appendix elongated but not inflamed; colonopexy.* (Hospital No. 314.)

Female, twenty-three years of age. Patient a neurotic, high strung, but intelligent young woman, had suffered from various intestinal troubles for many years. She was subject to attacks of diarrhoea alternating with constipation. A characteristic condition of intestinal auto-intoxication had developed. From the age of fifteen she had been subject to spells of petit-mal. At the time she came under observation her bowels were fairly regular,

but with much flatulence and colonic cramps. Bismuth X-ray picture showed a very marked ptosis of the colon, the hepatic flexure falling down two inches below the level of the iliac crest, and the greater part of the transverse colon sinking into the pelvis.

*Operation* (May 20, 1912).—The abdomen was opened by a three-inch longitudinal incision through the right rectus muscle. When the ascending colon and cæcum were brought into view, a distinct, well-formed membraniform band was found encircling the ascending colon at its middle and perceptibly narrowing its lumen. The cæcum was much dilated, was freely mobile, and hung over into the pelvis. The appendix was large but apparently normal in texture. It was removed. The constricting band was divided and the cæcum and ascending colon were fixed above the crest of the ilium to the parietal peritoneum of the right side by three silk sutures which were introduced through the anterior longitudinal band. The transverse colon was then brought up and a series of chronic catgut sutures, six in all, were placed through all the layers of the transverse mesocolon, catching the omentum also below the colon and thence catching the anterior abdominal wall along a line two inches above the umbilicus. The result of these sutures was that the colon was slung from the anterior abdominal wall by a transverse omental hammock (procedure of Coffey). The wound was then closed. The patient made an uncomplicated operative recovery. The later result of the operation has been to give her great relief from her previous intestinal troubles and practically to transform her life.

*CASE XII.—Pericolic membranous reflection binding first portion of transverse colon and hepatic flexure to right parietes; hepatic flexure constricted; cæcum dilated; appendix chronically inflamed; gall-bladder inflamed and extensively adherent to duodenum; cystic duct impermeable.* (Hospital No. 369.)

Woman aged forty-six years. A vivacious, energetic woman, with a history that during the period of years between her twentieth and thirty-fifth year of age she had many attacks of supposed subacute appendicitis. These then ceased to recur and in general she enjoyed good health and led an active life for the succeeding ten years, although she was subject to attacks of so-called gastric disturbances. There was also a tendency to constipation. Five months before coming under observation she experienced a sudden attack of excruciating pain, which was referred to the right hypo-

chondrium. This was relieved by morphia hypodermically, but for some days thereafter the gall-bladder region remained very tender. Since the first attack similar ones of varying severity have continued to be experienced at intervals which have gradually grown shorter, until during the ten days immediately preceding her entry to the hospital they occurred every other day. Upon admission, in the interval between the attacks, there was no pain nor tenderness nor tumor to be felt in the region of the gall-bladder; there was no muscular rigidity; temperature and pulse normal; there was simply slight tenderness upon pressure in the region of the appendix and along the ascending colon, but she was in a state of panic, apprehensive of the recurrence of her attacks.

Abdomen was opened on September 7, 1912, by a five-inch incision through the right rectus muscle from the costal arch downward. The stomach, pylorus, and duodenum, first exposed, were found normal. The gall-bladder was thick walled and moderately distended. A dense band of adhesions united the lateral surface of the gall-bladder to the adjacent surface of the duodenum. Continuing the examination along the right side downward, there was brought to view a dense adhesion uniting the right border of the omental apron to the transverse colon, and the hepatic flexure of the ascending colon to the adjacent abdominal parietes. When this band had been divided and the parts separated, there still remained several well-marked narrow bands of pericolic membranous formation encircling the colon near the hepatic flexure. These were also divided. When the cæcum was exposed it was found dilated and the appendix elongated, thickened, angulated, and bound down by adhesions, the centre of a chronic inflammatory process. The appendix was freed and removed. After all raw surfaces had been covered over by peritoneal suture, return was made to the gall-bladder region. The adhesions between the gall-bladder and the duodenum were divided and the gall-bladder opened. Its interior contained a moderate amount of tarry mucus, no bile nor calculi. The inner surface of the gall-bladder mucosa presented the characteristic strawberry-like state of chronic cholecystitis. The gall-bladder fluid contained an abundance of *Bacillus coli communis* as determined both by smears and cultures. A drainage tube was inserted into the fundus of the gall-bladder and the operative wound closed. The patient made an uncomplicated operative recovery.

No bile at any time appeared through the gall-bladder drains. The fistula was kept open, discharging daily a moderate amount of colorless, glairy mucus. No return of her dreaded paroxysms of pain has ever taken place. Three months after the primary operation the operation wound was reopened and the shrunken gall-bladder was extirpated. An equally favorable recovery from this second procedure followed, and the patient returned to her home in the third week thereafter. She has continued well to the present time and states that her bowels are moving normally, in this respect more satisfactorily than for the previous 25 years.

CASE XIII.—*Hepatic flexure bound to cæcum by membranous film, angulating ascending colon; appendix sharply kinked and chronically inflamed.* (Hospital No. 376.)

Female, thirty-eight years of age. A quite adipose woman, decidedly neurotic, who 12 years ago developed presumed pulmonary tuberculosis with haemoptysis, for which she went south and recovered. Always had an irritable stomach, with frequent attacks of nausea and vomiting and symptoms of pyloric spasm. Suffered from intestinal bloating due to flatus. Was never jaundiced; was always constipated. Recently she had developed pain in the bladder, with irritability and pain in the region of the right kidney. Urine was reported to have contained albumin. When she came under observation she complained of more or less continuous aching and pain in the region of the right kidney. She suffered from occipital headache, frequent vomiting, and dysmenorrhœa; was unable to walk and was a confirmed invalid. A cystoscopic examination of the bladder gave negative findings. Pelvic examination showed the cervix extensively lacerated and the body retroverted. Upon coming to operation, after curettage and repair of the cervix, a right lateral incision was made through the sheath of the rectus to open the abdominal cavity. By this there was exposed a membranous film binding the hepatic flexure down to the cæcum and kinking the appendix sharply. The membranous adhesions were freed and the ascending colon straightened out. The appendix was in a state of chronic inflammation and was removed. The skin incision was prolonged downward and toward the median line and a separate median abdominal incision was made through the deeper structures above the pubis to expose the retroverted uterus. This was brought up out of the pelvis and its round ligaments plicated along its pos-

terior surface so as to swing it up in normal position (procedure of Webster). The patient made a smooth operative recovery and when discharged was greatly improved both in her mental and physical state.

CASE XIV.—*Proximal portion of transverse colon bound to ascending colon by dense membranous cover (double-barrelled shotgun arrangement); appendix chronically inflamed; gall-bladder inflamed and filled with calculi; liver prolapsed; stomach dilated and prolapsed; duodenum dilated and prolapsed.* (St. John's Hospital, Service of P. M. P.)

A woman, forty-four years of age, was admitted for relief of constipation and pain in the upper abdomen. During her whole life she had suffered from constipation and had always been afflicted with stomach troubles. Eighteen months before admission she suffered an attack of intense pain in the region of the gall-bladder, on account of which she was kept in bed several days. Later she had suffered regularly from pain in the epigastrium, starting about two hours after eating, which would be relieved by taking food. The constipation increased in degree and was attended with much flatulent pain. When examined the upper right rectus was tense and the stomach was dilated; no point of tenderness was elicited.

When the abdomen was opened the ascending colon and adjacent portion of the transverse colon were found bound down and covered over by a dense membranous veil, a typical membranous pericolitis. This veil was divided and reflected, freeing the colon and cæcum. The appendix when brought into view was found chronically inflamed and distended by faecaliths. It was removed. The stomach was prolapsed and the duodenum was dilated two or three times its natural size. The liver was prolapsed, the gall-bladder was the subject of chronic inflammation and contained 16 calculi. The anterior edge of the liver was sutured to the anterior abdominal wall. Tube drainage of the gall-bladder was established and the wound closed about the drainage tube.

Subsequent recovery uncomplicated. Tube removed at end of twelve days.

In this case it was observed that the under surface of the ascending and transverse colon was perfectly normal, free from adhesions of any kind. The presence of the membranous for-

mation on the anterior surface of the intestine only might suggest a doubt as to whether it was originally caused by infection from the intestine.

Since this operation to the present time the patient has been able to eat anything in moderation, without any gastric or intestinal distress. Her bowels move naturally.

CASE XV.—*Cæcum confined by broad membranous veil, thickened to form dense band covering appendix and inserted into terminal ileum, forming pronounced ileac kink; appendix chronically inflamed; healed duodenal ulcer, with abundant adhesions between duodenum and gall-bladder.* (Hospital No. 394.)

A man forty years of age. In childhood was troubled with spells of repeated vomiting and attacks of so-called indigestion. Between the ages of twelve and twenty-five there were occasional spells of indigestion, followed by longer intervals of comfort. Twelve years ago began to suffer, especially after periods of much mental effort and concentration, from attacks of pain in the epigastric region. These would last from a few days to several weeks. The persistence of these attacks have greatly diminished his ability to discharge the duties of his avocation, which is such as to frequently demand great mental and physical exertion. Is subject to habitual constipation. Abdominal palpation elicits pain and tenderness in the epigastrium; otherwise negative. Test meals show hyperacidity which, however, is not always present. Examination of stool gives strong test for blood. X-ray examination indicates attachment of pylorus to the gall-bladder and liver.

Abdomen was opened through the right rectus muscle by incision extending from the free border of the ribs to  $1\frac{1}{2}$  inches below the umbilicus. The omentum was adherent to the anterior abdominal wall. After this had been separated and the colon exposed, the cæcum was found held down by broad thin bands typical of membranous pericolitis. The appendix was covered in by a strong band of adhesions which passed from the lateral parietal wall of the iliac fossa over the appendix and was inserted into the ileum  $1\frac{1}{2}$  inches from the ileocæcal junction. This band held the ileum down and markedly angulated it. The appendix was also angulated, its tip adherent to the small intestine and the omentum. The appendix was in a condition of chronic inflammation. The adhesion bands were divided and reflected and the appendix removed.

Returning to the epigastric region the pyloric extremity of the stomach and adjacent duodenum was found attached to the gall-bladder and liver by abundant adhesions. Portions of these were developed into distinct bands which held up the duodenum. All these were broken up by blunt dissection. The gall-bladder when exposed was not much altered, nothing in its condition calling for intervention. Exploration of the jejunum did not develop any angulation or constriction. All the parts were replaced in as normal a condition as possible and the wound closed.

The patient made an uncomplicated recovery. The immediate relief from the constipation and pain from which he had been suffering was very marked. At the time of making the present report, ten months after the operation, the improvement has continued and the relief experienced has been such as to justify the operation made.

Analysis of this case suggests four individual factors as existing, namely, membranous pericolitis, chronic appendicitis, ileac kink, and duodenal ulcer with consequent gastroduodenal hepatic adhesions. The primary condition was due to the pericolitic formation, and according to the observations of Flint and Eastman may be accepted as having been embryonic in origin. The later conditions were secondary, infective in character, and creating a succession of lesions which reacted upon each other to produce the progressive pain and discomfort.

*CASE XVI.—Lower half of ascending colon and the cæcum constricted by membranous expansion which binds them to the lateral parietes; appendix buried beneath the membrane and chronically inflamed. (Hospital No. 413.)*

Woman aged forty-six. A fragile, neurotic woman who applied for relief primarily of symptoms produced by uterine myomata. She also complained of occasional discomfort referred to the right iliac region, accompanied by the formation there at times of a gaseous bunch. Abdominal palpation revealed in addition to the presence of a moderate myoma of the uterus deep tenderness over the appendix and over the gall-bladder. The abdomen was opened by a median incision extending from the umbilicus to the pubis. The cæcum and the ascending colon presented in a state of gaseous dilatation; their walls were congested. A broad, well-marked membranous adhesion constricted the lower half of the ascending colon and the cæcum, binding the intestine

to the lateral parietal wall. When this was divided and reflected and the ascending colon was drawn medially, the appendix came into view buried by the cæcum and covered by membranous folds. It was in a condition of chronic inflammation. It was removed. Two myomatous masses were then enucleated from the uterus. The raw spaces left after the various procedures were covered in by peritoneum and the abdominal wound closed as usual. Operative recovery uncomplicated.

CASE XVII.—*Membrane reflected from cæcum over appendix to peritoneum lining iliac fossa; appendix acutely inflamed; membrane congested.* (Hospital No. 415.)

A woman thirty-three years of age. Admitted with symptoms of acute appendicitis. Inquiry elicited a history that ten years ago she had an attack of acute pain in the right iliac fossa. Repeated attacks since that time. The last attack two years ago. Admitted with typical symptoms of acute inflammation of the appendix. When the abdomen was opened a generally congested cæcum presented, behind which was a mass fixing the cæcum to the iliac fossa, within which the appendix was buried. The appendix was enucleated in a condition of acute congestion. Associated with this congestion of the appendix there was a distinct membranous reflexion passing from the appendix over upon the lower anterior portion of the cæcum. In this ran many turgid venules. This membrane was distinctly organized and plainly differentiated from the inflammatory exudate in which the appendix was embedded. It was necessary to divide and reflect this membranous covering before the appendix could be enucleated. The appendix was removed by the usual method, the raw peritoneal surfaces covered in by suture. Uncomplicated recovery.

CASE XVIII.—*Cæcum covered in by pericolic membrane; meso-appendix continued upward on to terminal ileum, and by reason of inflammatory fixation of appendix into right iliac fossa constricting and making tense the ileum (obstructive ileac kink); dilatation of ileum; ulcers of duodenum and of stomach.* (Hospital No. 431.)

Man sixty-nine years of age, of apparent good general physical condition. For many years, however, he had suffered from gastric symptoms, consisting of spells of pain and burning and indefinite distress in the epigastric region, coming on three or four hours after meals, waking the patient at night. These attacks would be

relieved completely and immediately upon the ingestion of food and alkalies. After such attacks, varying from a few days to several weeks, there would be intervals of complete freedom from discomfort. During more recent years he has complained of fulness and aching in the region of the cæcum. During the two weeks immediately previous to admission he had passed several tarry stools. He was then seized with an acute prostrating pain referred to the epigastrium, with vomiting of large quantities of coffee-ground material. When admitted he was in a condition of shock, with weak pulse, 140, dyspncea, distended and rigid abdomen, a tympanitic resonance in the hypogastric region, and with marked rigidity and tenderness in the right upper quadrant of the epigastrium. The abdomen was opened through the right upper rectus muscle. Several quarts of grumous material mixed with food were found in the peritoneal cavity. The pyloric end of the stomach was covered over by dense adhesions which fastened it to the posterior wall of the abdomen so densely that no liberation under the circumstances was possible. Just proximal to the pyloric vein on the lesser curvature was a patent ulcer the size of a ten cent piece, from which poured great quantities of grumous material. The ulcer opening was closed in by a row of Lembert sutures, over which was tacked the omentum. The peritoneal cavity was wiped out as well as possible. Counter incision was made on the right flank and one below the umbilicus for drainage. A drain was also left in the epigastric wound. The patient did not rally and died five hours after operation.

Upon postmortem there was found an old very definite pericolitic membrane covering in the cæcum. The appendix, partially obliterated, was bound down to the right iliac wall by dense adhesions. Continuous with the meso-appendix was a proliferative fat laden mass of tissue which continued up over the ileocæcal junction and on to the ileum. This by reason of the fixation of the appendix to the right wall of the iliac fossa markedly constricted the lumen of the ileum. The ileum proximal to this constriction was markedly dilated. The wall of the gall-bladder, thickened, was covered by old inflammatory bands, its mucosa in a condition of chronic inflammation. The gall-bladder had been drawn down and become adherent to the upper surface of the duodenum and was involved in an old scar process which joined them to the head of the pancreas behind. The head of the pancreas

was hard and infiltrated. There were in this region many old cicatrices proximal to the pylorus. It was stenosed to an opening about  $\frac{1}{4}$  inch in diameter. On the lesser curvature of the stomach there was a perforation the size of a ten cent piece, which opened freely into the peritoneal cavity. On the posterior inferior wall of the pyloric antrum extending to the pylorus proper was a perfectly healed, punched-out round ulcer. The pyloric sphincter itself had been replaced by scar tissue. On the duodenal side of the pylorus on the posterior wall was a third ulcer, the size of a ten cent piece, with clean edges, which had perforated completely through all the layers of the intestinal wall into the substance of the pancreas which formed its base. The stomach itself was dilated.

The sequence of pathological conditions in this case was evidently first, the pericolic membrane, the chronic appendicitis, the angulation and constriction of the ileum, secondary to which in course of years developed the conditions in the upper abdomen which led to the final catastrophe.

CASE XIX.—*Cæcum and appendix fixed in the right iliac fossa by a mass of adhesions of inflammatory origin, distinct from these a membranous layer covering the posterior outer surface of the cæcum and binding down the chronically inflamed appendix; first part of sigmoid flexure adherent to left brim of pelvis; old salpingitis.* (Hospital No. 438.)

Woman, thirty-five years of age. Applied primarily for relief from vesical irritability. Upon examination it was found that she had a patent urachus and that she also suffered from chronic endometritis, chronic salpingitis, and chronic appendicitis. She was the subject of habitual constipation, and suffered from accumulations of gas in the colon. She had been operated upon two years before for hemorrhoids. Cystoscopic examination of the bladder revealed no bladder conditions which accounted for her symptoms. The uterus was curetted. The persistent urachus was exposed by a longitudinal incision, isolated and extirpated. The tubes and ovaries presented evidences of former inflammation which had now degenerated into sclerosis. The head of the cæcum was bound to the right brim of the pelvis by a strong band of adhesions. After these had been divided the posterior outer surface of the cæcum was found covered by a distinct membranous layer, beneath which the appendix was imprisoned. This was

divided and the appendix, in a condition of chronic inflammation, was enucleated and removed. Examination of the descending colon showed the first part of the sigmoid flexure bound down to the left brim of the pelvis by fibrous bands similar to those on the right side. These were likewise divided until the sigmoid was set normally free. The conditions as found suggested the presence at some preceding time of an infection of both tubes, consecutive to which adhesions binding down the colon had formed. This, however, could hardly have caused the peculiar membranous layer covering the posterior outer surface of the cæcum by which the appendix was imprisoned.

An uncomplicated operative recovery followed with entire relief to the abdominal and digestive symptoms. The bladder has greatly improved but still at times is irritable.

CASE XX.—*General ptosis of abdominal viscera; head of cæcum covered by a pericolitic membrane which is reflected over a chronically inflamed appendix.* (Hospital No. 440.)

Woman, thirty-nine years of age. A sallow, slender woman, who has been married two years, never pregnant. Occasionally since childhood, at long intervals, she has suffered from spells of faintness without losing consciousness, attended by vomiting and a sense of soreness through her bowels. She has always been constipated; has never had any attack of severe abdominal pain, but there is a constant sense of discomfort on the right side of the abdomen. She is practically incapacitated from active labor on account of the early exhaustion and aggravation of discomfort following exertion. She complains of indigestion, of much belching of wind. Examination shows a general ptosis of the liver, stomach, and colon. The cæcum is dilated and tender, the right kidney moderately prolapsed, and the uterus retroverted and prolapsed. Abdomen was opened by longitudinal incision from xiphoid appendix to the umbilicus. The prolapsed stomach protruded through incision. Liver was prolapsed to the level of the crest of the ileum so that the appendix and gall-bladder were in contact. The cæcum was prolapsed to the brim of the pelvis. The appendix was behind the cæcum and covered in by a pericolitic membrane. The chronically inflamed appendix was enucleated from its bed and removed in the usual manner. The raw surface left by the enucleation of the appendix was sutured to the lateral parietes near the crest of the ileum so as to fix and

elevate the cæcum and descending colon. The liver was rotated upward to its normal position below the diaphragm, and its suspending ligament was shortened by pleating it with chromic gut sutures, which were inserted into the anterior parietes above the level of the costal arch. The anterior edge of the liver, at the entrance of the round ligament into the longitudinal fissure, was also included in these sutures. Similar sutures were passed, fixing the anterior edge of the liver on either side, fastening it to the diaphragm. The gastrocolic omentum and the greater omentum were then sutured to the anterior parietes above the umbilicus by a series of these chromic gut sutures arranged transversely.

At the end of six months after the operation patient reported that her bowels were acting regularly, some aperient being indicated only occasionally. All the right side symptoms had disappeared but she had had some trouble from accumulation of flatus at the splenic flexure (left-sided discomfort). Her general health has greatly improved, but she is quickly fatigued when on her feet.

CASE XXI.—*Ascending and first portion of transverse colon bound together by a membranous envelope, thickened at points into distinct bands (double-barrelled shotgun arrangement); cæcum, appendix, and terminal ileum bound down to brim of pelvis by strong fibrous bands; appendix chronically inflamed; ileum kinked.* (Hospital No. 441.)

Woman, forty-six years of age. Admitted primarily on account of menorrhagia and profuse and offensive discharge due to adenomyoma of the uterus. In addition to the pelvic condition, she suffered much from constipation and severe abdominal pain, the maximum of pain being referred to the cæcal region. Suffers much from gaseous eructations and from characteristic symptoms of fecal stasis. When admitted to the hospital the abdomen was flat and relaxed but with gaseous distention of the cæcum. The entire ascending colon and the cæcum were tender, with maximum tenderness at the site of the hepatic flexure. When the abdomen was opened, by a longitudinal incision from the pubis to umbilicus, the ascending and transverse colon were found bound together for some five inches of their course by strong membranous bands springing from the anterior surface of the omentum near its colonic attachments and inserted into the lateral aspect of the ascending colon. The cæcum and appendix were bound down to the brim of the pelvis by strong fibrous bands which involved

also the last two inches of the ileum. Hidden beneath this cæcocolic membrane was the appendix in a state of chronic inflammation. The bands were divided and appendix enucleated and removed and the raw surface covered over by peritoneum. Two large cysts of the left ovary were excised. Uterus removed in the usual manner. Patient made an uncomplicated recovery. Her health thereafter became markedly improved. She gained steadily in strength and spirits and was relieved of all troublesome symptoms.

CASE XXII.—*Ptosis of stomach; cæcum and ascending colon covered by membraniform veil, which at the hepatic flexure was thickened into a distinct band constricting the hepatic flexure; appendix chronically inflamed; from meso-appendix a band-like reflection passing to ileum and angulating it (ileac kink).* (Hospital No. 451.)

A female, sixteen years of age. A bright, active young girl, who from early childhood has suffered from frequent abdominal crises of pain, vomiting, and diarrhoea. An especially aggravated attack occurred six months ago. When she was eight years of age she had a continued fever for a period of six weeks, since which time her general malaise dates. Her bowels are constipated, menstruation regular. Examination reveals a narrow lower thorax and upper abdomen and a large lower abdomen and hips, giving the general conformation of an hour-glass. There is ptosis of the stomach. The cæcum is distended and tender. Marked tenderness over the appendix.

Abdomen was opened by longitudinal incision through the right rectus muscle. Over the cæcum and ascending colon there was a delicate, congested, membraniform veil. This was thickened as it approached the hepatic flexure and formed a constricting band which bound down and diminished the lumen of the colon at that point. The appendix was not covered over by the membrane, but was elongated, thickened, and congested, lying down upon the brim of the pelvis. From the meso-appendix there was a reflection which passed over on to the ileum angulating it (ileac kink). The appendix was removed. The ileac reflection of its meso was divided and the ileum freed; the pericolic band which constricted the hepatic flexure was divided; the ptosed transverse colon was fixed to the anterior abdominal wall above and to the right of the umbilicus by two points of chromic gut suture. The

wound was closed without drainage. Immediate operative recovery without complication.

The relief of abdominal symptoms which immediately followed the operation was not permanent. Six months later, when examined, obstipation was present in as great a degree as ever, with a good deal of distress in the region of the transverse colon and the splenic flexure. A marked degree of pylorospasm was present. Further medical treatment has been instituted. In the event of its failure to relieve an ileosigmoidostomy may be considered.

CASE XXIII.—*Marked membraniform layer covering and binding together ascending colon and first part of the transverse colon (double-barrelled shotgun arrangement); at the hepatic flexure a band-like development in the membrane constricting the gut; appendix not covered by membrane but in condition of chronic inflammation.* (Hospital No. 462.)

Woman, twenty-two years of age. Well developed, always well until six months ago, when after the birth of her first child she began to suffer from constipation with much distress, due to accumulation of flatus in the colon, particularly in the region of the cæcum. Eight weeks ago had acute appendicitis. Much vesical irritation. Upon examination she had marked tenderness over the appendix, with discomfort on pressure over the region of the hepatic flexure. Urine full of colon bacilli. X-ray-bismuth examination showed dilatation of cæcum and ascending colon; marked angulation at the hepatic flexure, with first part of transverse colon running parallel to the ascending colon for about four inches (double-barrelled shotgun arrangement).

Abdomen opened through the right rectus muscle exposed a marked membraniform layer covering the ascending colon and the cæcum and the first portion of the transverse colon, binding them together in the position previously demonstrated by the X-ray examinations. That portion of this membrane which covered the hepatic flexure was more strongly developed, forming a band markedly obstructing the lumen of the colon at that point. This band and the remaining portion of the membraniform veil were divided and reflected until the bowel was liberated and fell into its normal position. The thickened and chronically inflamed appendix was removed. Patient made an uncomplicated operative recovery. Three months after operation she reported that her bowels were moving normally from one to two times daily and that her general

condition was excellent. She has, however, had several attacks of pyloric spasm relieved by vomiting. Still has occasional frequency of urination.

CASE XXIV.—*Cæcum bound down by dense membrane which covered in the appendix; band extending from appendix to ileum, which was constricted by it.* (Hospital No. 467.)

Woman, fifty-eight years of age. Since birth of her child 35 years ago has suffered from frequent spells of so-called stomach trouble, characterized by acute cramping pain in the right upper abdomen accompanied by vomiting. These attacks would last from a few minutes to some hours. Has been icteroid, but never distinctly jaundiced. The attacks were always followed by marked tenderness in the right hypochondrium. In the intervals between these attacks she suffered from epigastric distress after meals, with frequent vomiting, much flatulent belching and bloating.

Right rectus incision exposed the cæcum bound down by a dense membraniform cover which included the appendix and bound it to the mesentery of the ileum, causing a constriction of the ileum one inch proximal from the cæcum. The constricting band binding down the appendix was divided, loosening the ileum, and the appendix itself was dissected out from its covering and removed. The pericolic membrane was divided and reflected. Passing to the hypochondriac region a greatly dilated duodenum and a chronically inflamed gall-bladder bound together by extensive adhesions were exposed. No ulcer of stomach or duodenum. Duodenum separated from gall-bladder. Gall-bladder brought up into wound, opened, and 17 gall-stones removed. Tube drainage of gall-bladder established. Balance of wound closed by layer sutures. Uncomplicated operative recovery.

CASE XXV.—*Cæcum and ascending colon covered and bound down by strong membranous bands, upper portion of which constricted hepatic flexure; appendix chronically inflamed; liver and stomach prolapsed; duodenum dilated and adherent to gall-bladder.* (Hospital No. 479.)

A woman, forty-four years of age, who always had trouble with her stomach. Two years ago had an attack of severe pain in the epigastrium, confining her to bed for some days. Thereafter she was subject to attacks of pain in the epigastrium, which would come on about two hours after eating and would be relieved by

partaking of more food. This condition became more aggravated, causing her to be confined to bed for a space of five months. During this time her constipation was very marked. When admitted to hospital she was emaciated. Her lower thorax and epigastrium were narrow. Her general nutrition, however, was still fair. The upper right rectus was quite tense, especially over the pylorus and gall-bladder. Stomach was dilated and prolapsed below the umbilicus. There was moderate tenderness in the right iliac fossa.

Operation at St. John's Hospital. The abdomen was opened by a median incision. The prolapsed stomach was as had been appreciated. In addition, the duodenum was greatly dilated, so that it was difficult to distinguish between the stomach and duodenum. Gall-bladder was entirely hidden by adhesions which bound it to the duodenum and pylorus. The liver was prolapsed. The cæcum and ascending colon were bound down by strong membranous bands, the upper portion of which constricted the hepatic flexure of the colon. The colon and cæcum were mobilized by dividing the bands that confined them. The appendix, in a state of chronic inflammation and distended by fecal concretions, was enucleated and removed. The liver was placed in its normal situation and sutured to the anterior abdominal wall in two places, according to the method of Coffey. The gall-bladder was freed from its adhesions, opened, and 14 gall-stones removed. Tube drainage was established. The gastrohepatic ligament was shortened by a purse-string suture, which was fastened to the anterior abdominal wall. The abdomen was closed with the exception of the gall-bladder drainage opening. Patient made an uncomplicated operative recovery. With the establishment of convalescence she was at once able to take food with comfort. At the present time she is able to eat practically anything. Her bowels move normally, only occasionally calling for the assistance of laxatives.

CASE XXVI.—*Cæcum and ascending colon covered by strong membranous film; appendix chronically inflamed; band from appendix to ileum angulating and fixing ileum (ileac kink); inflamed gall-bladder adherent to duodenum; old healed duodenal scar.*  
(Hospital No. 470.)

Man, twenty-five years of age. Patient during childhood had many attacks of abdominal distress accompanied by vomiting, culminating at seven years of age in a severe attack of what was

called acute gastritis. From the age of seven until fifteen he suffered much from pain localized in the left iliac fossa. For the last ten years has had to be extremely careful of his diet, frequently suffering from nausea and vomiting. These attacks have been more marked during the past year. Ten weeks before admission he had a very acute attack of pain in the upper abdomen, with much vomiting of greenish material. Ten days ago he had a similar attack. He suffers from constant epigastric distress. He has recently complained of many short attacks of stabbing pain in the right inguinal fossa. Examination shows him to be an emaciated man. There is marked tenderness in the epigastrium. The left upper rectus is moderately rigid. Pressure over McBurney's point elicits moderate tenderness and acute pain referred to the left inguinal fossa and to the splenic flexure of the colon. Test meal reveals achlorhydrica haemorrhagica gastrica. Examination by X-ray-bismuth shows the stomach moderately prolapsed; defective peristalsis of the lesser curvature near the pylorus; ascending colon and first portion of the transverse colon dilated; mesocolon relaxed and transverse colon prolapsed into pelvis. The abdomen was opened through the right rectus. The cæcum was found completely covered by strong membraniform films which extended up over the ascending colon. The anterior ascending colon and half of the transverse colon were markedly whitened and thickened. The appendix, greatly infiltrated and congested, was covered in by a thickened membrane which passed below the cæcum on to the ileum, pulling the terminal ileum to the right and holding it in this position, markedly kinked. The membraniform bands were divided; the appendix enucleated and removed. Upper abdominal exploration disclosed a thickened, chronically inflamed gall-bladder adherent to the duodenum, pylorus, and lesser curvature of the stomach by strong adhesions. These adhesions were severed, allowing the various structures to resume their normal place and relations. The scar of an old healed duodenal ulcer was noted present on the anterior aspect of the gut. The gall-bladder was opened. A quantity of thick, tarry bile was evacuated, and drainage instituted. Wound closed. Uncomplicated operative recovery.

*After History.*—The later history of this patient has been as satisfactory as that of the previous patient (Case XXIV) has been unsatisfactory. Relief to all symptoms followed at once, and

during the months that have elapsed he has been normally free from all intra-abdominal sensations. Eats and digests completely a generous general diet. Bowels move regularly and spontaneously. Has increased in weight. Has been transformed from a suffering invalid into a normal active man.

CASE XXVII.—*Cæcum and appendix and terminal ileum enveloped in a membranous film; ileum angulated; appendix chronically inflamed.* (Hospital No. 484.)

Woman, fifty years of age. A stout woman who is still menstruating normally. Twenty years ago began to have attacks of pain in the right iliac fossa. During the years that have elapsed has had numberless attacks in various degrees of discomfort referred to that region. During the last few months has also had discomfort referred to the right hypochondrium. At times there is also gastralgia, nausea, and vomiting. Constipation is extreme. She has had pain referred to the umbilicus. Palpation reveals moderate tenderness in both the right iliac and right hypochondriac regions, and deep tenderness at the umbilicus. The abdomen was opened through a right pararectus incision. Gall-bladder showed evidences of an old cholecystitis without calculi. An old and delicate membranous film wrapped together the cæcum, ileum, and appendix, the ileum being bound to the cæcum at a sharp angle by a band of adhesions which invested the appendix. The appendix was long, thickened, and congested, and bound to the lower portion of the cæcum. It was enucleated and removed. The various portions of the pericæcal membranous film were divided. No pathological condition under the umbilicus. The gall-bladder condition was not active and it was thought not to call for any interference. Wound closed without drainage. Uncomplicated operative recovery.

#### CONCLUSION

As one reviews these cases, it is quite easy to accept in explanation of the presence of the extraordinary films and bands found in so many cases, investing more or less extensively the large bowel on the right side, the theory that they are persistent remnants of embryonic conditions which become contributors to disease and disability when, by the mechanical irritation of prolapsing organs tugging at a structure which

restrains it, or by an infection transmitted from within the bowel, a mild degree of proliferative inflammation is established that makes more dense and strong the constricting fibres until they interfere with peristalsis, obstruct the fecal current, and aggravate fecal stasis. It would seem as if sufficient clinical observation had now been accumulated to confirm and emphasize the teaching that right-sided pericolic membranous veils and bands, crippling the peristaltic functions of the cæcum and ascending colon, were of frequent occurrence, and that when present they form a well-defined surgical condition which always is a menace as to the future, and in many cases has already become the cause of ill health and suffering. Whenever, therefore, the abdomen is opened for the relief of conditions involving right-sided symptoms, the operation should be so planned as to make it possible to explore for their presence and do whatever is necessary for their removal.

## **PERICOLIC MEMBRANES AND LANE'S KINK.**

WITH REPORT OF NINE CASES.

**BY R. BLAND WILLIAMS, M.D.,**

OF THE U. S. NAVY,

[Surgeon, U. S. Naval Hospital, Brooklyn, N. Y.

MEMBRANOUS films attached to the colon were long ago described by Virchow and, more recently, by Jonnesco as the "parietocolic fold" and by Treves as the "bloodless fold," but it was not until these structures were described by Lane and Jackson, and their importance as causative agents of serious pathological conditions pointed out, that any particular interest was taken in them. Even now many persons seem loath to admit that an entirely new factor has been injected into the diagnosis and treatment of many, if not a very large percentage of all cases of chronic digestive disturbances.

The structures now commonly known under the names of Jackson's membrane and Lane's kink, differ materially anatomically, and perhaps, etiologically. The former consists of a broad layer of peritoneum or peritoneum-like membrane arising from the posterolateral wall of the abdominal cavity on the right side, emerging above from beneath the liver and at times extending downward to the outer side of the ascending colon as far as the cæcum. From this origin the membrane spreads over the first part of the transverse colon, the hepatic flexure and the ascending colon, and blends with the peritoneum of these structures near the attachment of the mesentery. The extent of the attachments of this membrane is very variable. It is frequently limited to the region of the hepatic flexure.

The membrane causing Lane's kink is a narrow band extending from the peritoneum of the right iliac region to a point on the terminal ileum, usually within a few inches of the ileocæcal valve. This band is attached to the under surface of the mesentery and to the wall of the ileum as far as its anti-

mesenteric border. Not infrequently, the appendix is adherent to the under surface of the mesentery and from its point of attachment numerous thread-like bands extend to the wall of the ileum. In such cases there may be no sign of any inflammation of the appendix, past or present.

Jackson's membrane can usually be divided and separated from the underlying colon practically without bleeding and without leaving an area bare of peritoneum. This can sometimes be done with Lane's band, but as a rule, the latter membrane seems incorporated with the peritoneum of the under surface of the mesentery and its division leaves a raw surface which has to be covered in.

The most common effects of these membranes and bands is to produce a kinking or angulation at two points, namely, at the hepatic flexure and in the last few inches of the ileum. Such angulation causes a partial obstruction, intestinal stasis, and occasional spasmodic efforts on the part of the intestine to overcome the obstruction.

Three theories have been advanced as to the etiology of the membranes under consideration: First, that they are evolutionary in origin; second, that they are congenital or developmental, and third, that they are inflammatory.

The first theory is that of Lane and may be briefly stated as follows: In the assumption by man of the erect position, there is a tendency of the intestine to gravitate downward, this tendency being especially marked at the flexures and at the cæcum. In the process of evolution, nature forms bands and membranes to support these points—there is a "crystallization of the lines of strain."

The second theory advanced by Mayo, Cheever and others attributes the formation of the membranes to certain abnormalities in the rotation and descent of the cæcum. Mayo suggests that the cæcum may insinuate itself beneath a fold of peritoneum and, in carrying this downward, during its descent produces the membrane. Cheever believes that the membrane is formed by the cæcum and colon rotating to the left instead of to the right, thus drawing a peritoneal layer over them.

The third theory, that of inflammation, is advanced by Pilcher, Gerster and others. According to this theory the membrane is the result of irritation caused by the "oft-repeated, but mild," inflammation arising from within the bowel and transmitted through its walls.

Lane, Gray, Fagge and others, in England, and Bainbridge, in this country, describe membranes attached to the splenic flexure and sigmoid in addition to those attached to the hepatic flexure, ascending colon and terminal ileum. The majority of American writers, notably Jackson, Mayo, Pilcher, Binnie and Frazier, describe the membrane as being confined to the right side of the abdomen. The latter view coincides with the theory of the congenital or developmental origin of the membranes, and agrees with the conditions observed in the cases quoted below. In Germany, much importance has been attached to excessive mobility of the cæcum—the "cæcum mobile" of Wilms. American writers seem to agree that this excessive mobility is probably due to the dragging of a dilated and overloaded cæcum, itself the result of an obstruction by membrane at the hepatic flexure. It seems unquestionably true that in many cases the cæcum is unduly movable and prolapsed.

Many writers seem to confuse the condition we have attempted to describe with a general enteroptosis or with ptosis of the stomach and transverse colon, the gastrocoloptosis of Rovsing, the midline ptosis of Coffey. That an enteroptosis will cause attacks of abdominal pain with vomiting and will in time result in a true picture of auto-intoxication, there is no doubt, but in such cases the limitation of the pain and tenderness to the right side of the abdomen is entirely lacking. It is this limitation of pain and tenderness with the other symptoms enumerated below, that makes the diagnosis of obstruction by these right-sided membranes, whether we call them by the name of Lane or of Jackson.

What then are the symptoms that will lead us to a diagnosis of Jackson's membrane or Lane's kink? Briefly, they are symptoms of obstruction and of stasis, the latter evidenced by the symptoms of intestinal auto-intoxication.

The symptom most frequently complained of is *pain*. The pain may be acute or it may be chronic with exacerbations, and it is *almost always referred to the right side of the abdomen*. The pain is usually most marked in the region of the appendix (terminal ileum) or at the hepatic flexure. There may be acute attacks of abdominal pain, with or without vomiting, but in such cases the pain is never referred to the epigastrium or diffused over the entire abdomen as is the case with appendicitis. It is in no case a general pain, becoming local, but is commonly referred to some definite locality, in the right side of the abdomen, most commonly the right iliac region.

Less frequently the pain is referred to the region of the hepatic flexure, but in such cases has none of the characteristics of gall-bladder pain with which it might be confused.

In some cases the pain is a chronic soreness with feeling of distention, and in many such cases pressure over the cæcum and ascending colon seems to give relief. In a few cases pain is not localized.

*Tenderness* is even more strictly localized than the pain. Very commonly this tenderness is most marked at the usual site of appendix tenderness, but perhaps a little lower down. In other cases the maximum tenderness is in the region of the hepatic flexure, that is, below the ribs on the right side but further out than the common site of gall-bladder tenderness.

In many cases there is a feeling of distention by gas. One patient complained of even the weight of his undershirt. These attacks of pain and tenderness are not accompanied by a rise of temperature or an increase in the number of the leucocytes, which further differentiates the condition from an acute inflammation.

*Constipation* is a marked feature of practically all these cases. It may be moderate or it may be extreme. It may be the chief complaint, or it may not have especially attracted the patient's attention.

*Auto-intoxication* is a prominent feature of a majority of the cases. In addition to abdominal pain, tenderness, and constipation, these patients complain of backache, headache, lassi-

tude and a general sense of ill-being. The complexion is sallow, muddy and, occasionally, spotted. There are rings beneath the eyes, and the hands are cold and clammy. The appetite may be disturbed, and the patient complains that whatever he does is only accomplished with the greatest effort. Such patients are evidently carrying a heavy load, and they finally drift into a neurasthenic state with an unlimited number of complaints of pain and of aches, of lassitude and of malaise.

In some cases the symptoms of auto-intoxication entirely overshadow the symptoms of pain and tenderness and constipation and it is only by careful questioning, and examination that the latter points are brought out.

In many cases bismuth radiographs are of great assistance in diagnosis. This is especially true of angulation at the hepatic flexure. Obstructions at the terminal ileum are far more difficult to radiograph, but fortunately in this latter group the clinical symptoms may be relied upon for diagnosis.

The treatment of these cases is essentially surgical. A mechanical fault requires a mechanical remedy. By diet, massage, and purgatives, of which latter the "Russian mineral oil" is the best, the symptoms in some cases may be held in abeyance. The surgical treatment consists of a free abdominal incision through the right rectus muscle, a careful exploration of the regions of the terminal ileum and of the hepatic flexure, division of all restricting bands and membranes and a covering in of all raw surfaces when such result. This may usually be easily accomplished by dividing the restricting membrane transversely and uniting the margin of the denuded area longitudinally. In some cases division of the membrane leaves no denuded area, consequently plastic approximation of peritoneum is unnecessary.

In those cases in which the cæcum is dilated and unduly movable, a plication of the walls of the cæcum at the "caput coli" may be done, and the movable cæcum may be fastened to the posterolateral wall of the abdomen. We have accomplished this in two cases by uniting the external longitudinal band of the cæcum to the lateral abdominal wall by two or three interrupted sutures of Pagenstecher.

There follow the histories of nine cases admitted to the United States Naval Hospital, New York, N. Y., during the past eight months upon which the foregoing remarks have been based:

CASE I.—G. M., private, U. S. Marine Corps, aged twenty-two years.

The following entries are from the health record of the patient:

"U. S. S. Wyoming—December 6, 1912. Note: During the last two months G. M., private, U. S. Marine Corps, has been to the sick-bay frequently, complaining of indefinite and vague symptoms. It is believed he is malingering. Warned."

"U. S. Wyoming—December 28, 1912—*Constipation*. This man is chronically constipated, bowels not moving without artificial help. He states that he has gone as long as seven days without a movement. He is a chronic sick-bay caller, complains of constant headache, pains in abdomen, swelling of feet, muscle cramps, etc., is not a husky individual. Is listless, apathetic, in fact, a diagnosis of "constitutional inferiority" might cover the case. Transferred to the U. S. Naval Hospital, Brooklyn, N. Y., for further disposition."

Admitted December 28, 1912, with the diagnosis of *constipation*.

*History*.—Never seriously ill before present trouble. Has always been somewhat constipated, bowels going two or three days without moving.

Present trouble began about four months before admission with sudden attack of dizziness, headache, abdominal pain and nausea. Was unable to walk to Barracks. Since this time has had headache, pain in abdomen, dizziness and at times, cold sweats. Bowels have not moved since the onset of this somewhat acute condition without a purgative, and then only once every three or four days. On one occasion seven days elapsed without a movement. Feels sick and weak almost all the time. Feels somewhat better after exercise.

On admission a sallow, unhealthy-looking individual who complains of headache and constipation.

Abdominal palpation shows quite marked tenderness in the region of the hepatic flexure.

Bismuth radiographs six, eight, ten, twelve and twenty-four

hours after taking four ounces of bismuth oxychloride in milk shows marked obstruction at hepatic flexure. The radiograph is shown in Fig. 1.

*Operation* (March 18, 1913).—Ether anaesthesia. Right rectus incision eight inches in length. Ascending colon dilated, transverse colon collapsed. Just beyond the hepatic flexure a pericolic membrane stretches from the surface of the bowel near the attachment of its mesentery over its anterior and upper surface, losing itself in the peritoneum of the posterior abdominal wall beneath the liver near the attachment of the mesocolon.

This membrane is freely divided transversely. When division is completed gas is seen to pass into the collapsed transverse colon. The constriction is evidently relieved. A membrane binding together the last two or three inches of the ascending and the beginning of the transverse colon is likewise divided. Appendix removed. No Lane's bands or kinks, no obstruction at splenic flexure or sigmoid. Abdomen closed in layers.

March 27. Recovery uneventful save for signs of moderate consolidation at right base causing rise of temperature to 102.8° on the third day, which almost immediately subsided to normal.

April 15. Patient weighs six pounds more than before operation and bowels are moving every day.

April 28. Discharged to duty, well. He feels and looks like a different man.

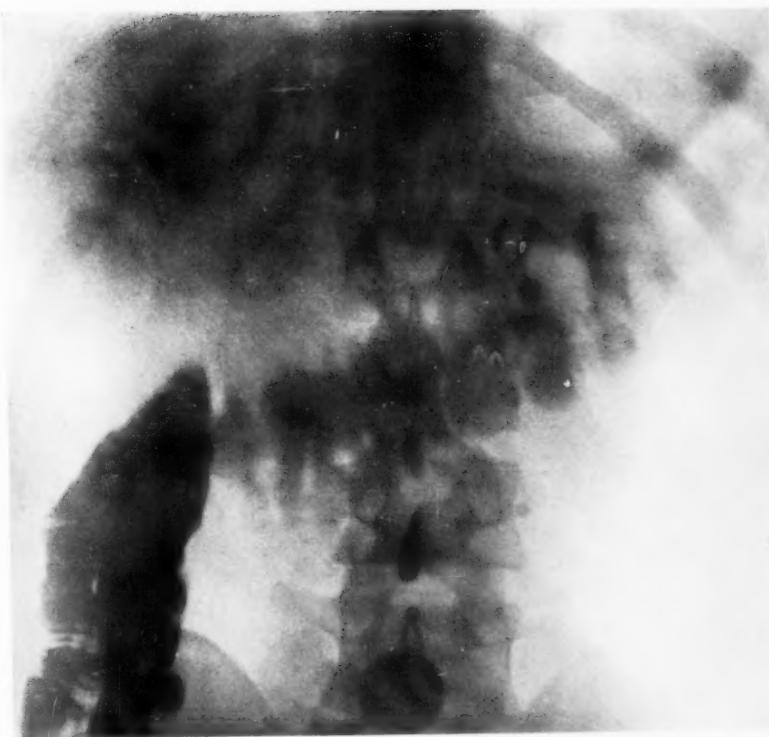
This case has been traced for five months and patient has remained well.

**CASE II.**—G. A. L., chief carpenter, U. S. Navy, aged thirty-seven years. Admitted March 27, 1913, with diagnosis of neurasthenia.

Trouble began about eight months before admission with malaise, constipation and vague abdominal pain limited mainly to right side of abdomen. The abdominal pain increased in severity and became more strictly localized. There were never any acute attacks referred to the epigastric region. Constipation became more marked. Headache soon appeared with a feeling of fulness in the head, and marked lassitude.

With these symptoms he was operated upon three months after the beginning of his trouble (October, 1912). The appendix was removed through a low right rectus incision, and the patient was informed that there was a "Jackson's membrane." He im-

FIG. I.



Case 1. Radiograph 12 hours after bismuth meal, showing marked obstruction of the hepatic flexure. At operation a Jackson's membrane was divided, which stretched over the flexure and caused the obstruction.

FIG. 2.



Case II. Radiograph taken 48 hours after bismuth meal, showing acute angulation at the hepatic flexure and marked stasis. Note that the first part of the transverse colon descends parallel with the ascending colon, almost to the ileocecal valve. Note that the tail of the bismuth column has not passed the hepatic flexure at the expiration of 48 hours.

FIG. 3.



Case IV. Radiograph 24 hours after bismuth meal, showing obstruction just beyond the hepatic flexure. The entire mass of bismuth is in the caecum and ascending colon.

FIG. 4.

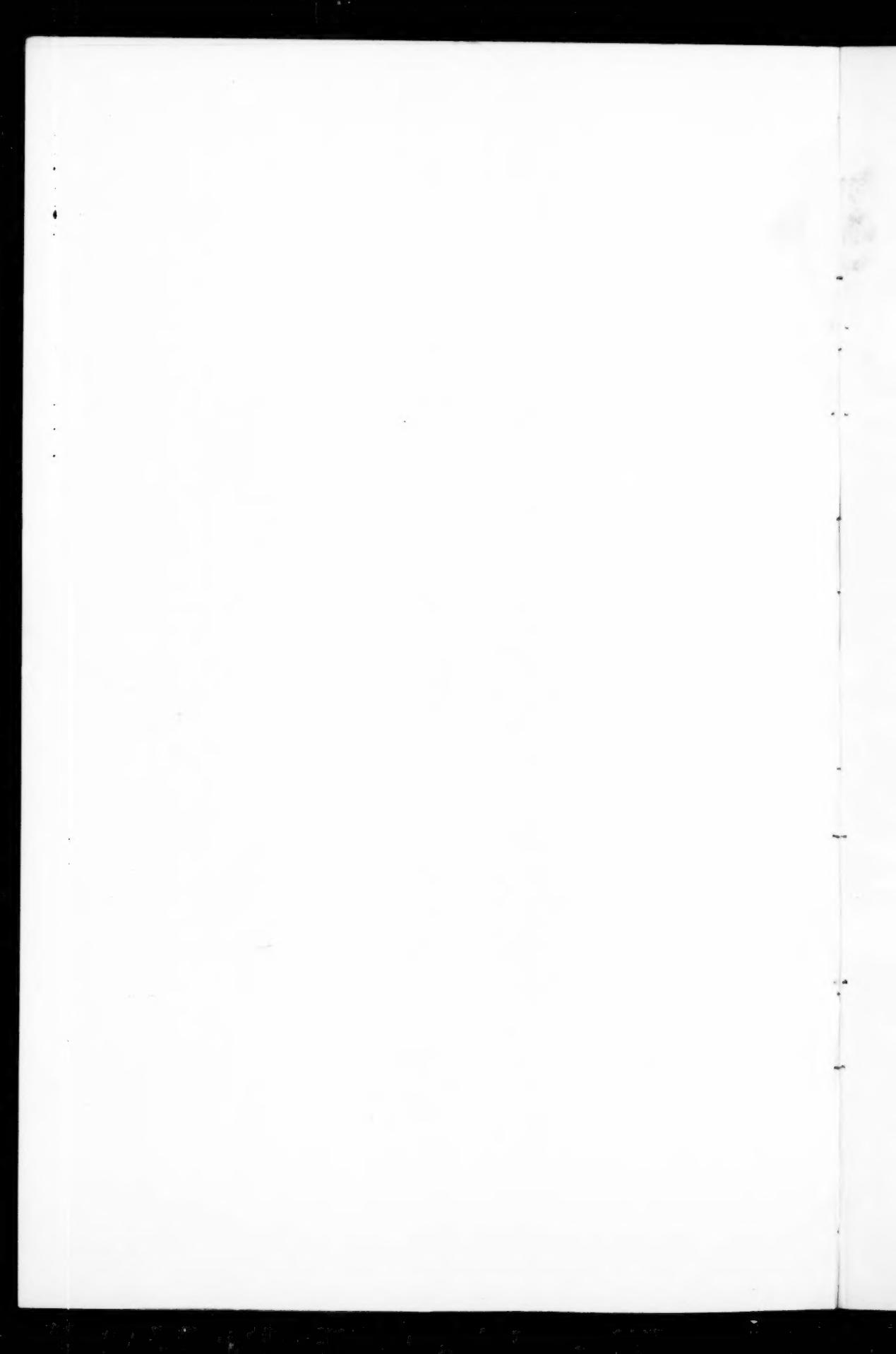


Case VI. Radiograph 36 hours after bismuth meal, showing angulation at hepatic flexure and marked stasis.

FIG. 5.



Case IX. Radiograph 38 hours after bismuth meal. Note sharp angulation in proximal third of transverse colon. At operation a Jackson's membrane was found which held together the descending and ascending limbs of this angulation. Upon division of this membrane the intestine unfolded as if released from a bag.



proved for a month, or more, following the operation and then the symptoms became more marked.

On admission, patient is a well-nourished, well-developed man of thirty-seven years. Has a distinct sallowness of skin and circles beneath the eyes.

The patient complains of headache, of abdominal pain and also of pains and aches in almost every part of the body. Since his operation, constipation has not improved.

Examination shows tenderness over the cæcum and ascending colon, especially marked in region of hepatic flexure. A bismuth radiograph of the intestines shows a marked angulation at the hepatic flexure, the first portion of the transverse colon descending parallel with the ascending colon to the neighborhood of the ileoæcal valve. Mass of bismuth still present in the cæcum and ascending colon after forty-eight hours. The X-ray photograph is shown in Fig. 2.

Patient was put upon mineral oil (Russian paraffin) but did not improve. The headaches and the other pains and aches continued. He complained of distention by gas. Even the weight of his undershirt seemed a burden. A right-sided tenderness persisted, at times being marked over the entire cæcum and ascending colon, and especially at the hepatic flexure. Frequently a dilated cæcum could be easily palpated.

The patient was discharged to sick leave May 28, 1913, and returned June 27, 1913, somewhat improved as to his mental condition, *i.e.*, the symptoms of neurasthenia were not so marked.

Operation was refused, and the patient was discharged July 16, 1913, in about the same condition as when he was primarily admitted.

It is evident in this case that a sharp angulation at the hepatic flexure brought about stasis in the cæcum and ascending colon and that this condition led directly to the various neurasthenia symptoms above noted. The region of the hepatic flexure could not have been explored through the small and low rectus incision.

CASE III.—W. B. J., landman for electrician, U. S. Navy. Admitted May 14, 1913, with the diagnosis of acute appendicitis. Gives history of constipation for seven months; of headache and backache for six months. Five months ago pain was first noticed on the right side of abdomen and has continued to date. Has never vomited. Feels dull and lazy and tires easily.

*Examination.*—Shows distinct tenderness over ascending colon, most marked over McBurney's point. There is also tenderness over sigmoid but not so marked. X-ray examination shows stasis, bismuth in ascending colon after twenty-four hours.

*Operation* (June 9).—Ether anaesthesia. Right rectus incision. Appendix chronically inflamed and adherent to under surface of mesentery of ileum with numerous fine bands running from the tip of appendix to a point on lateral wall of ileum about two inches from its termination. This condition caused acute "kinking" at this point. The bands were divided. Appendix removed. Denuded surface covered by drawing together the peritoneum in a direction at right angles to the bowel. This denuded area was mainly upon under surface of mesentery.

June 20. Primary union. Recovery uneventful save for considerable post-operative vomiting for first two days.

July 3. Bowels move daily. Pain entirely relieved. Discharged July 10, 1913, bowels move daily without purgatives. Headache, backache and abdominal pains have entirely disappeared.

CASE IV.—L. O. S., chief pharmacist, U. S. Navy. Admitted May 26, 1913, with intestinal auto-intoxication.

*History.*—For the past year has had frequent and severe headache. During this time there has been marked constipation with occasional mucous diarrhoea. Has found it necessary to take purgatives once or twice a week on the average. Chief complaint headache, also complains of malaise and lassitude. On admission a fairly well nourished man of thirty-eight years, complexion clear. Examination shows moderate but well-marked right-sided abdominal tenderness, most marked in the region of the hepatic flexure. No history of acute attacks of abdominal pain.

A radiograph of the intestines taken twenty-four hours after the administration of four ounces of bismuth oxychloride in a pint of buttermilk shows the cæcum and ascending colon loaded with bismuth. Just distal to the hepatic flexure there is evidently a marked obstruction as the bismuth column terminates abruptly at this point (see Fig. 3).

A second radiograph taken forty-eight hours after bismuth meal shows that peristalsis has overcome the obstruction and that practically the entire amount of bismuth is in the transverse colon.

In this case there is evident obstruction and very marked

stasis, as the tail of the bismuth column has not passed the hepatic flexure at the end of forty-eight hours.

CASE V.—A. L. M., seaman, U. S. Navy. Admitted January 4, 1913, with deformity of nose. Deformity corrected March 11, 1913.

Readmitted June 11, 1913, with intestinal auto-intoxication. History of constipation, abdominal pain, slight malaise, lassitude and frontal headache for one year and a half. The pain was always referred to the right side of abdomen. Is able to do his work but does it with great effort.

*Examination.*—Well-developed, fairly well-nourished man of twenty-four years. Marked tenderness over McBurney's point and slight tenderness over entire ascending colon.

*Operation* (June 16, 1913).—Ether anaesthesia. Right rectus incision. Appendix chronically inflamed, removed. Cæcum extremely movable, can be carried across midline. Extending from the hepatic flexure to the parietal peritoneum in a direction upward and outward there is a well-marked Jackson's membrane producing a definite angulation at this point. This membrane is divided transversely and the denuded area covered by bringing together the peritoneum in the direction of the long axis of the membrane with a continuous Pagenstecher. The mobile cæcum is fastened to the posterolateral wall of the abdomen by two sutures of the same material.

June 24, 1913. Recovery uneventful save for moderate greenish vomiting for first two days.

June 30, 1913. Recovery uninterrupted.

July 3, 1913. Abdominal pain entirely relieved. Feels better in every way.

July 25, 1913. Discharged to duty. Feels entirely well. Bowels moving regularly.

CASE VI.—R. H. J., past assistant paymaster, U. S. Navy, age thirty-three years.

The following entries are from the health record of this patient:

"U. S. Naval Hospital, Washington, D. C., March 21, 1913. Admitted with history of severe abdominal pain followed by gaseous distention about March 5. Was very much prostrated at the time. Attack passed away with passage of flatus. Last night was seized with diarrhoea and passed a small amount of clotted blood, no tenesmus."

Admitted to the U. S. Naval Hospital, New York, June 29, 1913. Gives history of prolonged tropical duty and of mental strain and worry. About sixteen months ago had an attack characterized by abdominal pain, vomiting, dizziness and looseness of bowels. Since this time has had five or six similar attacks. During one of these attacks blood and mucus were passed. Bowels always regular. Complains of malaise, of lassitude and abdominal discomfort and occasional abdominal pain. This pain is not localized but there is marked local tenderness below the ribs at the hepatic flexure. Is markedly neurasthenic; dwells much upon his troubles, mental and physical. Is well nourished but is decidedly sallow; complexion muddy and there are dark rings under the eyes.

X-ray examination of intestines after bismuth meal shows very marked stasis. The bismuth begins to pass the hepatic flexure only after thirty-six hours. At this period the ascending colon is distended with bismuth and there is marked angulation at the hepatic flexure (see Fig. 4). The patient's history and physical condition with the X-ray findings making an almost positive diagnosis of chronic intestinal intoxication from stasis which is probably caused by Jackson's membrane at the hepatic flexure.

Discharged to duty June 30, 1913. Relief of condition by operation suggested but declined. This patient's condition has improved upon a vegetable diet and purgatives.

CASE VII.—J. W. E., chief gunner's mate, U. S. Navy. Admitted July 19, 1913.

A well-nourished man of thirty years. Has been chronically constipated for past three or four years. About one year ago had sharp attack of abdominal pain, confined to right iliac region, lasting only for a minute or two, no nausea or vomiting. Felt dizzy. About six months ago had a second attack, similar to the first, but more severe, lasting two or three minutes, no nausea or vomiting.

Third attack, three weeks ago, lasting for three days with remissions. During this time vomited frequently, whenever food was taken. Pain confined to right iliac region.

*Examination.*—Shows tenderness quite marked and strictly localized to a small area below and internal to McBurney's point.

*Operation* (August 20, 1913).—Ether. Right rectus incision. Two typical Lane's kinks were found, one about three inches and the second six inches from the ileo-caecal valve. The band produc-

ing the kink nearest the valve, could be entirely separated from the underlying mesentery. This band was simply divided and its division caused almost no bleeding and left no raw surface.

Division of the second band left a denuded surface which was covered by drawing peritoneum together in direction perpendicular to the gut.

The appendix, which was quite normal and lay behind and to outer side of cæcum and reached to the liver, was removed and stump inverted. Uneventful recovery. Feels better now (September 20) in every way. Bowels now move regularly, twice a day, without purgatives.

It is to be noticed in this case that the point of tenderness was over the site of the "kinks" and not over the site of the appendix.

CASE VIII.—U. S. P., seaman, U. S. Navy. Admitted August 6, 1913.

*History.*—Severe furunculosis of back for past seven months, frequent headaches for the past six months; constipation for the past seven months. Six months ago severe attack of pain in right iliac region, lasted thirty minutes, nausea but no vomiting.

Three months ago, second attack. Three weeks ago, third attack. One day ago, fourth attack. First attack most severe. In all attacks pain is limited to the right iliac region. There has been no epigastric or general abdominal pain at any time.

*Examination.*—A well-developed, well-nourished boy of twenty-one years, whose back is covered with a great number of furuncles for which he has been continuously under treatment since February 2, 1913.

Abdominal palpation shows tenderness over entire right side of abdomen most marked near McBurney's point. The point of maximum tenderness is rather strictly localized.

*Operation* (September 3, 1913).—Ether; right rectus incision. A long slender appendix is found which is adherent to the under surface of the mesentery of the ileum at a point about one inch from its tip. From this point numerous fine bands run to the lateral wall of the ileum at a point about three inches from the ileocæcal valve. When the ileum is lifted up these bands produce a marked kinking at their point of attachment. The appendix is absolutely normal. Appendix removed, stump inverted. The bands are divided and the raw surface is covered by bringing to-

gether its margins with a continuous Pagenstecher in a direction perpendicular to the gut.

September 30, 1913. Recovery was uneventful. Bowels now move daily.

CASE IX.—O. F. B., hospital apprentice, first class, U. S. Navy, age twenty-two years. Admitted September 16, 1913.

*History.*—Until the onset of present trouble was an unusually healthy and active man.

For the past two years there has been marked constipation with malaise and lassitude and frequent headaches. During this period the bowels have moved on an average of but once in three days. The patient has felt "dull and heavy" all the time.

About two months ago he first experienced abdominal pain, dull in character and confined almost entirely to the right side. The pain is most marked in the region of the hepatic flexure, but exists to a much less degree in the region of the appendix, and in the left iliac region. The appetite has been excellent and there is no discomfort after eating. On several occasions the patient has noticed a distinct distention of the right side of his abdomen.

On examination the patient is fairly well nourished but extremely sallow. There is marked tenderness on palpation beneath the ribs on the right side and to a much less degree at the site of the appendix. The dilated cæcum and ascending colon can be easily felt. Radiograph, thirty-eight hours after bismuth meal, shows marked angulation at the hepatic flexure and very marked stasis (see Fig. 5).

*Operation* (September 17, 1913).—Ether; right rectus incision. Appendix normal, removed. No Lane's kink.

Covering the first six inches of the transverse colon there is a Jackson's membrane, descending on the upper surface of the meso-colon from beneath the liver. This membrane contains numerous fine blood-vessels and is attached to the middle of the longitudinal bands of the transverse colon. On division of the membrane, throughout its entire length, the intestine unfolds as if released from a bag. Precisely this condition has been described by Jackson. Several bleeding points are caught with fine Pagenstecher. Division of the membrane leaves no raw surface. Abdomen closed in layers.

September 30, 1913. Un eventful recovery from operation. Calomel was given on the third day, post-operative, since which time the bowels have moved daily without purgatives.

## **PERICOLITIS SINISTRA.**

**BY JOSEPH RILUS EASTMAN, M.D.,**

**AND**

**ALBERT M. COLE, M.D.,**

**OF INDIANAPOLIS, INDIANA.**

REPORTS of cases of membranous pericolitis, involving the right half of the colon, have multiplied since Jackson made his first report, and the condition is now looked upon as an established clinical process of rather frequent occurrence. The splenic flexure and descending colon may be embraced in a similar manner by fettering bands or sheets of anomalous peritoneum. Virchow, Gerster, Cannon, Holzknecht and Bloch consider the splenic flexure a site of predilection for the process.

The patient whose case is here described was a man, aged sixty-four. The family and personal histories were negative as to any data pertinent to the condition for which he presented himself for examination. For about a year he had suffered extreme anorexia, with consequent loss of weight. Aside from a general sense of ill-defined discomfort over the abdomen and rather obstinate constipation, there were no other subjective symptoms. Examination of the abdomen revealed an irregular resistance occupying the site of the colonic splenic flexure. At X-ray examination the patient, with abdomen bared, was placed upon his back on a fluoroscopic table in the dark room with the X-ray tube below and the fluoroscopic screen above the table. An enema consisting of 90 grammes of barium sulphate, 100 grammes of bolus alba, and 1500 c.c. of water was slowly injected into the rectum by means of a bulb syringe, and while carried up through the bowel was observed fluoroscopically. The rectum, sigmoid and lower part of the descending colon were seen to fill quickly, but when the barium column reached the upper part of the descending colon it was arrested. It then slowly began to balloon out the bowel until it was dilated to the size of a large fist. After a delay of six or eight minutes the enema was seen to move on slowly into

the transverse colon, which it filled about half its length across the abdomen, where it was finally arrested, and repeated observations during a period of an hour failed to show it filling the remainder of the colon. After an interval of ten days a confirmatory examination was made and 2000 c.c. of enema, instead of 1500 c.c., was used. At this time the same observations were made. This enema was again delayed at the splenic flexure, widely dilating the descending colon below, and again after six or eight minutes the enema was seen slowly passing through the splenic flexure to fill the transverse completely this time, and then the ascending colon and cæcum. A plate was then taken which pictured the distended descending colon with a blurred outline at the splenic flexure.

The patient would not permit an examination with the bismuth meal given by the stomach to detect the degree of obstruction when the colon contents approached the splenic flexure the natural way.

The X-ray diagnosis was partial obstruction at the splenic flexure. From the other signs and symptoms it was inferred that the obstruction was probably malignant. At operation a condition of *extensive pericolitis involving the splenic flexure and descending colon* was found, as is fairly well illustrated in Fig. 1. The left lateral margin of the great omentum was attached to the serosa of the splenic flexure and descending colon by thin sheets and bands of peritoneum, which apparently had been formed by fusion of the anterior and posterior peritoneal laminæ of the omentum. These fused peritoneal layers of the great omentum passed in front of the descending colon and blended in with the left lateral abdominal serosa.<sup>1</sup> The whole of the descending colon was thus invested almost to the beginning of the rectum. It was, however, not possible to draw up a single sheet or sleeve of peritoneum as has been observed upon the right side. The picture was not unlike that of ordinary membranous adhesion formations which might attend or be consequent upon peritonitis, although there was, in this case, no history whatever of peritonitis.

<sup>1</sup>The phrenocolic ligament of Toldt is derived from the great omentum. It passes over the splenic flexure to adhere to the parietal peritoneum opposite the tips of the tenth and twelfth costal arches.—D. G. Reid.

FIG. I.



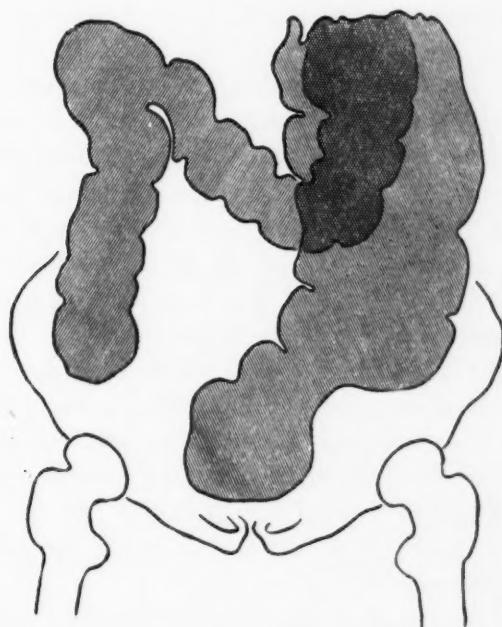
Extensive left-sided pericolitis with angulation and partial obstruction at the splenic flexure,  
as described by Gray and Anderson.

FIG. 3.



Cases in which the great omentum forms a covering to the underlying colon have been described by L. S. Pilcher and J. N. Jackson, and have been observed in the foetus by one of the writers (J. R. Eastman, *Surgery, Gynecology and Obstetrics*, May, 1913) and Douglas G. Reid, of the University of Cambridge (*Journal of Anatomy and Physiology*, October, 1912). In Pilcher's case the result of the presence

FIG. 2.



Descending colon filled with enema of barium sulphate, arrested at splenic kink.

of peritoneal sheets and bands thus formed was to sharply angulate the colon at the hepatic flexure and to bring parallel to each other the ascending colon and the first part of the transverse colon, causing them to lie side by side like the two barrels of a double-barrelled shotgun (*ANNALS OF SURGERY*, January, 1912).

In our case of pericolitis sinistra a somewhat similar state of affairs existed upon the opposite side, as indicated by Figs. 1 and 2. However, that the last part of the transverse colon

and the beginning of the descending colon should be held together in the double-barrelled relation is not remarkable in view of the circumstance that the splenic angle is, under normal conditions, an acute angle as shown in Fig. 3, and not one of 90 degrees as might carelessly be assumed. If there be ptosis of the transverse colon the angulation at the so-called splenic flexure may be quite sharp, for the phrenocolic ligament of Toldt is so firm as to preclude the splenic flexure from participation in the ptosis. If the phrenocolic ligament be short and tense, splenic kink as described by Gray and Anderson (*The University Press*, Aberdeen, Scotland, 1912), sometimes called Payr's disease, may ensue. In our case the splenic angle was sharply constricted and fettered by pericolic membraniform adhesions and the transverse and descending limbs of the colon were held up sharply angulated by the phrenocolic ligament. It was, in all probability, this sharp angulation of the colon and the fettering by pericolic bands which retarded the flow of the barium sulphate through this colonic segment, and gave rise to the ballooning of the bowel previous to the slow passage of the barium column through the constricted splenic angle. It was noted also that there were, in addition to the left-sided pericolitis, numerous adhesions between the left margin of the omentum and the ascending colon, and that the vermiciform appendix was buried beneath a pericolic membrane.

Since in the case here reported the membranous adhesions were, for the most part, not in the neighborhood of the caput coli or ascending colon, their origin cannot be ascribed to persisting fetal folds of Jonnesco and Juvara, or Treves or Douglas Reid. However, it is not altogether illogical to suspect such membranous adhesions, even upon the left side, of dating from the fetal period of life in view of the common appearance of such adhesions in the foetus. In Fig. 4 is shown the extensive area of peritoneal adhesion between the stomach and transverse colon, as observed by Douglas Reid in the foetus. That extensive pericolic membranes of the left side are consequent upon adhesion formation before cæcal

rotation, descent, and torsion has taken place can only be assumed. However, the general distribution of peritoneal adhesions in the foetus suggests the possibility of adhesions between the mural serosa and the peritoneum of the rotating colon having part in the causation of membranous pericolitis of the left side as well as of the right.

It is probable that an indeterminate proportion of pericolic membranes are of purely postnatal origin. Interesting in this connection is an observation of Bevan, who removed the

FIG. 4.

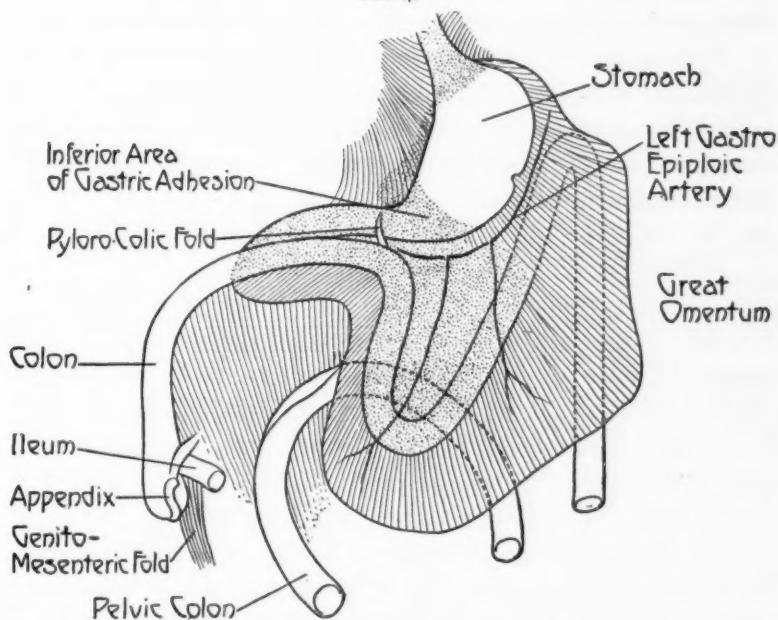


Diagram after Douglas Reid, showing area of peritoneal adhesion between the stomach and transverse colon in the foetus.

vermiform appendix in a case showing no sign of pericolic membranes. A year later he re-operated, finding a well-developed membranous pericolitis.

The discovery of pericolic membranes in the foetus does not explain their origin. The fact of their presence in the foetus and evidence indicating that such anomalous membranes are the result of peritoneal adhesion, for example between

the rotating colon and the mural serosa, still leave in doubt the nature of the process which actually causes the two serous surfaces to adhere, and, until otherwise proven, it seems fair to suspect, in the case of the foetus as well as of the adult, such well-known causes of adhesion as infection, mild or severe, and mechanical or other irritation.

The rather frequent occurrence of membraniform adhesions in dogs<sup>2</sup> emphasizes the likelihood of continued colonic stasis having an important part in their causation, as contended by Gerster, and supplies evidence to the effect that the upright posture is not an essential factor of their etiology.

It is of some interest to note that the extensive attachment of the left margin of the great omentum to the lateral mural serosa, as observed in our case, represents simply an extreme exaggeration of the adhesion which forms the apparently normal ligament of Toldt.

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<sup>2</sup> Eisendrath, Journal A. M. A., August 30, 1913.

## CANCER AND PRECANCEROUS CONDITIONS.\*

BY WILLIAM L. RODMAN, M.D., LL.D.,

OF PHILADELPHIA.

Professor of Surgery in the Medico-Chirurgical College; Surgeon to Presbyterian and Blockley Hospitals.

At no time in the world's history has that ancient, pitiless and ubiquitous, hence most dreaded enemy of mankind, cancer, been studied so generally, so systematically, so unceasingly as during the recent past. State and philanthropist the wide world over have entered upon its pursuit with unlimited energy, talent and means, and if the quest has not been entirely fruitful, no unbiased critic can say that it has been fruitless. Much has been revealed concerning the history, pathology, and treatment of carcinoma, even though its direct or exciting cause remains the great unsolved problem of the day, as it has been of the ages.

Unfortunately too, and it should be candidly admitted, but little additional information has been given to the clinician which might enable him to detect unerringly, in its early stages, a foe so stealthy that mastery over its victim is oftentimes complete before its recognition, since a disease strictly local, and therefore curable primarily, has become, through metastases, a general, constitutional and incurable one. Not only is this true of deep-seated and internal carcinomata, as one might reasonably expect, but almost is true of superficial or external lesions, susceptible of either palpation, sight, or both.

Important, superlatively needful, as it is to ascertain, if possible, the cause of cancer, are we not, in its search, neglecting valuable means already at hand, facts proven to the hilt, which if employed rightfully and in time would undoubtedly save thousands where hundreds are now being saved?

Will it not startle some of you, experienced surgeons that

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\* Annual Oration of the Academy of Surgery of Philadelphia, delivered October 6, 1913.

you are, to know that 90 per cent.<sup>1</sup> of the cases of cancer of the cervix are inoperable when first seen by a surgeon; that 90 per cent.<sup>2</sup> of gastric carcinomata are inoperable; the same with 29 per cent.<sup>3</sup> of those in the breast, and, on account of its more rapid course, a larger number of cancers of the tongue and mouth? Mark you, I do not mean only that so many cases are unfavorable or fairly late ones, but are actually inoperable; in other words, without a reasonable chance of removing the disease. What does this mean to us as citizens of the United States where there are upward of 40,000<sup>4</sup> deaths from cancer annually, and where, as in Great Britain, perhaps, one man in eleven and one woman in eight<sup>5</sup> dies of the disease?

Why it means that 15,000 at the least die of cancer of the stomach. How few are saved one is, for the cause of so heavily handicapped surgery, ashamed to state. In not a great many more is the slightest attempt made to save life, the most done being a palliative gastro-enterostomy. How many here have saved such a patient? Your essayist candidly admits that he has not rescued a single one, and does not expect to, unless it be by accident or fortuitous circumstance, until an entirely different order of things obtains. So long as gastric cancer is looked upon as a medical affection and treated as such until starvation threatens its host, when, only as a *dernier ressort*, a surgeon is called in to assume the responsibility for a death which is no longer doubtful, but only a matter of time, just so long, I maintain, will surgery be impotent. Naturally the physician, nearly always through pride of opinion, waits until he can by symptoms, signs, test meals, skiagrams, etc., etc., make a positive diagnosis. When this can be done the case is no longer operable. We, as surgeons, know it, and yet keep on doing palliative operations, which may or may not palliate, but which certainly, at the very best, are only of temporary

<sup>1</sup> Childe.

<sup>2</sup> Munroe and Bottomley.

<sup>3</sup> Halsted.

<sup>4</sup> Chas. H. Mayo.

<sup>5</sup> Roger Williams.

benefit, while their deterrent effect upon others with operable conditions is far-reaching and permanent. To them their friend or acquaintance died, not from cancer, but an operation; hence they themselves will have none of it.

When it is realized that the situation is about as bad in uterine cancer, not much better in cancer of the mouth and tongue, and only somewhat better in mammary carcinoma, then I say that it is time for surgeons to teach, write and act collectively and in unison. Operations upon advanced cases of carcinoma should neither be practised nor sanctioned, unless for the best of reasons. We have all, through a mistaken sense of duty to the patient in hand, performed unless, or worse, harmful operations, and in every such instance have increased the croakings of the pessimist, in and out of the profession, and unconsciously made it more difficult to rescue the operative surgery of malignant disease from that obloquy which now rightfully rests upon it as a whole. The results of individual operators, in particular regions to which they have given special attention, have done something, it is true, to inspire hope, if not to create a justifiable optimism concerning a disease that, not so very long ago, was looked upon, no matter where situated and with or without operation, as hopeless. But, as intimated above, and the argument is frequently used and pressed home, has not the patient a right to demand the slim chance of cure that has been held out to him, even when the surgeon of experience feels assured there is no chance at all? I unhesitatingly answer in the negative and for the following reasons, though of course I wish it clearly understood that by advanced I mean inoperable and not border-line or doubtful cases. By inoperable, to repeat, we mean a condition no longer local, but general, and one which cannot, therefore, with reasonable certainty be extirpated on account of metastases to adjacent or distant tissues or organs. In the first place your essayist does not hesitate to affirm that he has little faith in the spontaneous recession of a carcinomatous growth after incomplete removal, as he has seen no such result in any of the many operations he has himself done, assisted in, or seen others do, after a

fairly large experience of the disease in more than thirty years of practice. Nearly, if not all, of such instances can be more rationally explained by a modern and enlightened pathology. A majority of them were abdominal growths and, moreover, were sarcomata. Sarcoma is a less stable growth than carcinoma and one can more readily believe, even though he does not comprehend how and why, that such neoplasms may, in some mysterious manner, undergo retrogression after a rapid, active, even luxuriant growth. I have never known spontaneous recession of a sarcoma to occur, but have seen it take place after free use of X-rays and Coley's toxins in a few instances. In most of these, again, the mass underwent retrograde changes only temporarily, later on to resume an unwonted activity and destroy its victim. But as diminution often, and seemingly complete disappearance occasionally, has occurred coincident with the use of various non-operative measures, I am willing to admit that it may follow incomplete removal by the knife. But every surgeon of experience must admit that nearly always the more active varieties of sarcomata, the large spindle and small round-celled varieties, the latter particularly, are made worse and life is shortened by incomplete removal. In such circumstances a masterful inactivity on the surgeon's part is best.

It is now accepted that gastric ulcers, diverticulitis, peri-caecal inflammations, and benign tumors undergoing inflammatory action so closely at times mimic malignancy as to baffle the most experienced and observant surgeons. Consequent upon and with the appreciation of this fact, few instances of supposed cure have followed exploratory and incomplete operations for abdominal cancer, and fewer still are likely to be reported subsequently. This is a day for cold, hard facts, and not for the perpetuation of surgical vagaries that had birth in the fancy of observers who, however able, were not possessed of the means now employed and accessible to all.

Further, even if I could be convinced that occasionally an undoubtedly carcinomatous mass may in some strange, vague and inexplicable manner pass away, I should still look

with disfavor upon partial removal. It is just as likely, more so I think, to happen if not stirred and whipped into an unwanted activity by incomplete operations; for often have I witnessed the latter, but never, I repeat, the former process.

A further, better and less speculative reason for non-interference is that the surgeon should not hold himself higher than the law which says "the greatest good to the greatest number." Great as our obligations to individual patients are, they are greater to all of our present and future clientele and to the cause of surgery. No one can or will deny that the best of laws, under the most beneficent government, exceptionally work individual hardships. Finally, such belated and ill-starred procedures first raise, then destroy false hopes in patient, family and friends and in addition thereto cause needless anxiety, suffering and expense. Palliative operations for the relief of pain, dyspnea, pyloric, intestinal or other forms of obstruction are manifestly proper and should be done, even more frequently than they are, but only with the thought of relieving a definite symptom and not with the slightest hope of effecting a radical cure. Moreover, such a purpose should be fairly stated to the family of the patient, so that responsibility can be placed where it rightfully belongs. Were this always done there would soon come a better appreciation, professional and lay, of the inestimable benefits of early operation and, as surely, the infinite hazards of delay. And with it will come, what is desirable, a public sentiment which demands early operation in superficial lesions that are apparent and exploration in deep-seated ones which, from their nature are not apparent.

Let us turn from inoperable to operable cancer and see what can be accomplished if such patients are divided into early, fairly early, and late or unfavorable cases, the same classification made of patients with acute affections such as appendicitis, peritonitis, strangulated hernia, intestinal obstruction, diseases of the gall-bladder, etc.

The pessimist, and he is still about, will find as much to make him decry operative results in any of the above conditions

as in cancer, if he will only consult the various hospital reports the country over and then make a sum total of the enormous number of unnecessary deaths resulting from conditions which were once simple, local, and therefore, nearly always curable by early operation. It is needless for any member of this Academy to take that trouble, as it is only necessary for him to recall how often he and his assistants are telephoned to, and then usually at night, or worse, the wee, sma' hours of morn, to see, for the first time, some valuable member of society either actually dying, or in a condition to preclude operation at the hands of any surgeon of judgment. There will be others, again, so extremely ill that one thinks carefully, balancing every argument for and against operation before coming to a decision; others still more favorable from an operative standpoint, and yet toxic enough, through delay, to make the operator think many times as he prepares for operation, how much better it would have been if some one had not already blundered. Surgeons are largely responsible for such a condition in all of our hospitals, for just so long as they are willing and continue to operate upon such patients, just so long will they be furnished.

That such patients with acute disease sometimes unexpectedly recover after operation is, of course, quite true, and justifies the taking of many chances. But such is not true of advanced carcinoma, where a reasonable knowledge of pathology makes it next to certain that nothing can or should be done in the way of surgery. We are not depriving the patient of any chance at all, or one so slight as to be negligible, whereas we are giving others their chance of an early and beneficent operation by compelling them to see and understand the value of timely action. Is there a man here who has not seen one or many women conceal from their relatives and friends tumors of the breast, on account of their dread of an operation, giving nearly always the same reason—that some friend had been unsuccessfully operated upon?

But to be more specific and less general, let us consider briefly a few facts made plain by the last report of the Cancer

Commission of Pennsylvania, prepared with great care by its Chairman, J. M. Wainwright.

There were four hundred cases reported by surgeons throughout the State and, while the number is not great, it is enough to give a fairly accurate knowledge of conditions which obtain in Pennsylvania. Bad as they are, the statistics probably indicate a more favorable condition than actually exists, as a record is usually not made of the most advanced cases which do not come to operation at all.

Only 68 per cent. of the superficial carcinomata and 48 per cent. of the deep-seated ones are operable when first seen by a surgeon. The superficial lesions had been apparent to their hosts eighteen months before a surgeon was consulted, and in deep growths well-marked symptoms of the disease had been present fourteen months. In superficial growths thirteen months had elapsed, on an average, between the time the family physician was first consulted and the date of operation; and in deep-seated ones, a year.

In 3 per cent. of the cases of cancer of the breast the physician first consulted failed to make a local examination, and in 13 per cent. advised local applications or "waiting to see what develops."

In gastric cancer the first physician consulted made no local examination in 9 per cent. and gave bad advice in 20 per cent.

In cancer of the cervix no local examination was made in 10 per cent. and bad advice given in 20 per cent.

In cancer of the ovary no local examination was made in 14 per cent. and non-intervention advised in all of them.

In conclusion Wainwright says: "This work was undertaken to show, if possible, just where the greatest responsibility lies. It is, of course, to be proportioned to the medical profession on the one hand and the general public on the other. There is the greatest possible room for improvement in both, but of the two it would seem that the medical profession should show a marked improvement first. We cannot view with complacency the fact that, as a general average, cancer patients

have been under the care of their family physicians more than a year before they applied for a radical cure."

This report shows clearly enough that only a comparatively few patients afflicted with cancer get the benefit of an operation while the disease is local, simply for the reason that metastases will, in the vast majority of instances, have occurred before a surgeon is consulted. If only a single one of the nearest lymph nodes be involved the disease is no longer local, but becoming general, and the chance of cure less than one-third what it would have been had operation taken place before such involvement. For instance, in the cases of mammary cancer operated in the Johns Hopkins Hospital since 1889, 80 per cent. of those without glandular involvement, and only 25 per cent. of those with axillary infection, were cured.

I am not aware that any one has attempted to indicate just when the lymphatic glands first show involvement in the several regions of the body where carcinomata frequently arise. It is safe to assume that it very generally does occur within a twelve-month on an average. In cancer of the tongue, mouth, breast, and cervix uteri it will take place sooner I feel certain, and in the skin, lip, large intestines, and rectum, probably later. The little knowledge we now have is conjectural and based upon the time when there is palpable enlargement. This avails next to nothing, as it will vary with the accuracy of the local examination, the region, and the amount of fat and other tissues superlying such enlargement.

In the mammary gland cancer will cause palpable enlargement of the axillary nodes in rather more than a year; according to Gross (15.6 months), Winiwarter (14.7), Oldekop (16.5).

Finney states that such enlargement occurred in the patients treated at the Johns Hopkins Hospital in from ten to thirteen months, and that 84 per cent. of such patients showed axillary involvement when first consulting the surgeon. Of W. T. Bull's series 65 per cent. showed palpable enlargement when he first saw them. Finney's opinion is undoubtedly nearer the truth, based as it is upon a larger number of cases and formed at a much later date, when the significance of such involvement is

so much better appreciated. In my own series of private cases enlarged axillary glands could be felt, or at least I thought so, on an average of 11.2 months after the patient noticed the original growth. But to show how misleading such evidence is, nearly all of my cases, early and late, exhibited demonstrable enlargement when the axilla was dissected. But when the microscope would have first shown evidence of the transference of cancer cells from the original focus to the nearest lymphatic gland is what we would like to know. That it varies with the age of the patient, site and variety of the growth is probable. Young women with numerous and patent lymphatics present earlier and more general metastases and therefore are less favorable subjects as a rule for operation than elderly women. Yet it is my opinion that too forcible and dogmatic statements have been made concerning the prognosis of cancer in young women. One of the best known pathologists, connected with one of the largest clinics in the country, recently wrote: "The woman under thirty-five years of age with carcinoma of the breast who lives more than two years after its discovery, however early and however radical the extirpation, is almost unknown."<sup>6</sup> I have had many such patients.

One, twenty-one years old, operated on in May, 1900 (adenocarcinoma), has since married, borne at least two children and is perfectly well. No axillary involvement.

Another, twenty-four years old, operated on June, 1904, is now a trained nurse and is robust in every way. Tumor was a typical scirrhus with moderate axillary involvement.

Another, thirty-three years old, had a typical scirrhus with considerable axillary involvement, so great, indeed, that on account of it and her youth I gave a very gloomy prognosis to her physician and family, predicting recurrence within a year. She has seen me regularly since, and on the fifth anniversary of her operation (March, 1913), she was examined and found to be free from recurrence.

A fourth and still more significant case was that of a young woman thirty-three years of age, sent to me from Wilkes-Barre.

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\* Wilson, St. Paul Med. Jour., June, 1913.

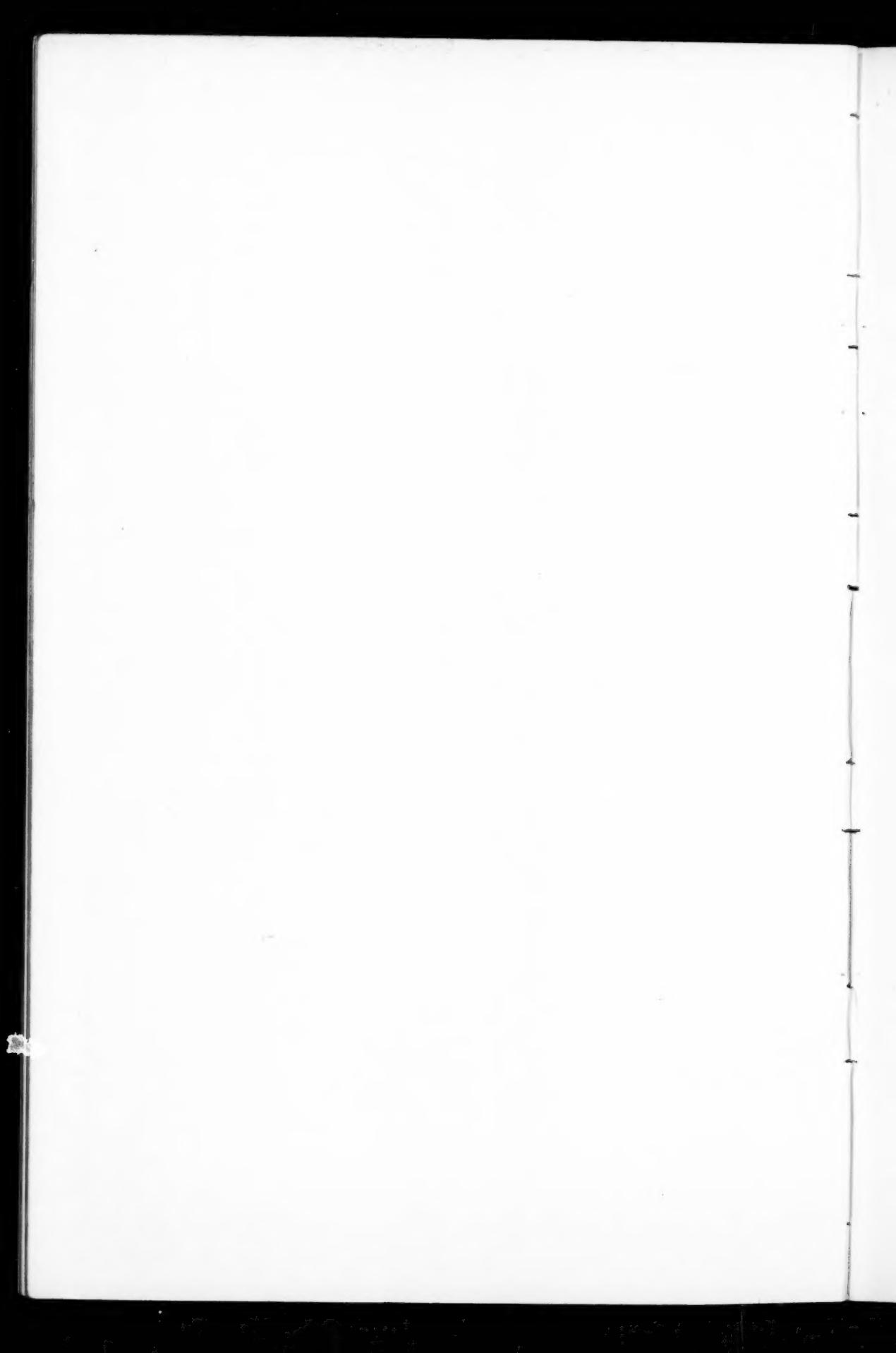
She was nearly five months advanced in pregnancy when she was operated upon in the Jewish Hospital, in November, 1905. She had a typical scirrhous of the left mammary gland with moderate axillary involvement. At the present time, nearly eight years after operation, she is perfectly well.

That metastases to axillary and even supraclavicular glands may occur very early, and not in young women either, is shown by the report of another case. A maiden lady, fifty-six years of age, was sent to me for operation on June 3 last. She had not the slightest knowledge of any trouble in her breast until five weeks previously. At that time there was a slight induration in the upper and outer quadrant of the right breast about one and a half inches from the nipple. It was painless. Very soon the entire breast became involved and three weeks later she consulted her physician. There was no history of trauma at any time. At the time when she visited me the entire mamma was involved, skin red, and its local temperature very much increased. It looked like an acute inflammation, as shown by the photographs and drawing which I had made. The axillary glands were greatly enlarged, so much so as to cause moderate oedema of the arm. There was also a lump in the subclavian triangle as large as an English walnut. The breast was adherent to the costal wall. The opposite mamma was quite normal and the axilla as well. It was recognized as a typical example, and the most acute one I have ever seen, of what Volkmann has described as carcinomatous mastitis. I declined to operate, as all of the four cases I had previously seen and operated on died; three of them within six months and one in fifteen months. A two weeks' trial of X-rays was made, at the end of which time she being no better but worse, radium treatment was begun. She was only able to take a few treatments, as her general condition grew rapidly worse. The entire breast became, so her physician Dr. Bird tells me, "as purple as an egg-plant." She died August 9, just three months after the disease was first recognized.

We have said that the location of the growth and its variety influence axillary and other metastases. Adenocarcinoma has little tendency to cause metastases, glandular or otherwise. Encephaloid or medullary cancer does so quickly. Scirrhous stands midway between them.

FIG. I.





Growths in the outer hemisphere are likely to cause axillary and supraclavicular involvement earlier than similar lesions in the inner hemisphere; *per contra*, the latter the more surely and the more quickly cause involvement of the liver, mediastinum, vertebræ, and the opposite breast in the order named. From the arrangement of the lymphatic vessels this is just what should be expected. The mediastinum was, until recently, thought to be most obnoxious. Handley has clearly shown the liver to be more so. I am not certain that the mediastinum should even be placed second. My own series indicates clinically a larger per cent. of metastases to the bones, particularly the sternum, vertebræ, and long bones than to either the liver or thorax, and gives to them the melancholy distinction of first place. That the liver and lungs may both be more often found involved at autopsy I grant, but this may be, I think is, due to the fact that the abdominal and thoracic cavities are systematically opened and their contents carefully examined, while the osseous system, unless suspected, is not examined. That many metastases to liver and lungs occur subsequently to those in bones I have not the slightest doubt.

Terminal pathology is valuable, but the pathology of the living is far more so, and upon it surgery must advance if it does so at all. Many of my operations have been followed by intercostal neuralgia, paraplegia dolorosa, involvement, with and without fracture, of humerus and femur, before there were either symptoms or signs of abdominal or thoracic complications. A well-taken skiagram will usually locate the lesion.

In August, 1912, I was asked by my colleague, Prof. Anders, to see in consultation a woman from Illinois, who had been operated upon for carcinoma of the breast the preceding November by a distinguished Western surgeon. The patient had come East to spend the summer and had been taken in June, while staying near Boston, with intercostal neuralgia. Nothing seemed to give her relief but opium. Early in August she came to her sister who lives near Philadelphia. When I examined the cicatrix it was found to be smooth, supple, and absolutely free from disease.

Her only symptom was intercostal neuralgia. A careful examination of her back led me to believe that certain vertebrae were affected, and I gave her sister and husband a very guarded prognosis, plainly stating my fears. A skiagram was made the following day by Dr. Pfahler which served to confirm my opinion. The operator was at once written to for further information. His report showed an early scirrhus, and that a favorable opinion as to a radical cure had been entered in his notes. He was in every respect warranted in thinking so at the time, and certainly had done a very complete operation. During the next month the patient was, I learned, better, then worse alternately. Soon after her return home in October, or less than a year after operation, she died. Spinal metastases had taken place before operation and could not have been suspected. There is no other rational explanation of this case and the following ones in my own practice which are briefly outlined.

One of them, a married woman of thirty-two, was operated on in May, 1908, and died December, 1910, thirty-one months after operation. To the very end the cicatrix and surrounding structures were absolutely normal. Intercostal neuralgia began within a year after operation, and a palpable tumor of the spine, apparently beginning in the intervertebral disc between the eleventh and twelfth dorsal vertebrae followed later, a skiagram of which is shown. At the time of her death, from reports made to me, it must have been enormous. Strangely enough she did not have paraplegia, as the growth was forward instead of backward. She could not walk well, however, for a year before her death.

In January, 1909, I operated on a married woman, thirty-nine years of age, for a well-marked scirrhus with pronounced, but not extensive, axillary involvement. During the meeting of the Congress of American Surgeons two years ago she was one of thirty cases exhibited to show the post-operative result. Although the scar was perfectly normal, so was the axilla, and she had gained in weight, looked perfectly well and was doing all of the cooking and housework for herself and family, she reported to me that she was not sleeping well on account of a pain in her side at night. A careful examination convinced me that it was intercostal and probably the result of metastasis to a vertebra which was tender upon pressure. A skiagram was made the following day which

FIG. 2.



FIG. 3.



confirmed my fears. The third and fourth lumbar vertebræ showed involvement.

In September, 1910, Mrs. C., aged sixty years, was operated upon for a large scirrhous of the breast with great axillary involvement, the extent of which was not appreciated, though it was palpable, before operation, she being a very stout subject. She had known of the enlargement in her breast more than two years. When I expressed surprise that she had allowed it to remain so long her reply was: "It does not hurt me now, I feel perfectly well and am only consenting to removal because my physician tells me that it should be done." There were no enlarged glands above the clavicle or evidence of abdominal or thoracic metastases. On this account, notwithstanding its duration and the marked axillary involvement, I was disposed to advise operation and give her the chance. After a most extensive operation she made a rapid recovery, going home in less than two weeks. To my surprise her health remained excellent for 13 months. She then began to have pain in her back and side. A skiagram showed metastases to the eleventh and twelfth dorsal and second lumbar vertebræ. She lived several months longer and I am informed that local recurrence was manifest at the time of her death. This was to have been expected from the duration and extent of the disease at the time of operation.

A fifth case, aged thirty-one, also well advanced in pregnancy, between 6 and 7 months, was operated upon in her house in this city, she declining to enter a hospital, in May, 1905. She was delivered at term of a healthy female child. Three years and four months later she was delivered of a healthy male child. She had seemed entirely well in every way until this last pregnancy, when a recurrence in the scar near the axilla was noticed in the last months of gestation. Thirty months after the first operation she called at my office with a friend, upon whom I had also operated for cancer of the breast, and both of them appeared absolutely free from recurrence. One of them is still well, more than eight years after operation. I was not again consulted until a month after her last confinement, at which time there was a large mass the size of an orange, almost ready to ulcerate. From the statements made by patient, trained nurse, and physician, the tumor must have grown with startling rapidity during the last month of gestation and the month of lactation. Such has been the progress

of most of the malignant tumors that I have encountered in pregnant women. In November, 1909, or forty-two months after she was operated upon she died of frightful convulsions which began a fortnight earlier. Prior to the first convolution, and between the others, the patient suffered from severe headache and backache, due, I doubt not, to metastases to vertebrae and cranial bones, there being no other rational explanation of her symptoms. Her kidneys were sound but her liver was enormous. Drs. Musser, Miller and myself were of this opinion. Autopsy was not allowed.

I have records of another case operated on early in 1904 for Dr. P. S. Donnellan. Within eight months she began to have intercostal neuralgia and died within a year of apoplexy. She had what I have frequently called a "succulent" breast, plump, vascular, with the glandular tissue well marked and lymphatics abundant. I remember that Donnellan at the time of operation was struck with and questioned me as to the expression (succulent).

She had never borne children though married many years. Her age was forty-eight. There were probably both spinal and cranial metastases. I had never at that time employed the Röntgen rays for diagnostic purposes.

In addition to these five cases, which I saw during the final stage of their illness, I have letters from the family physicians of others which cause me to suspect that they, too, died of spinal metastases. I have records of two very interesting cases treated in Louisville, Ky., where the osseous system was involved. In one of them a spontaneous fracture of the surgical neck of the left humerus followed a large scirrhus of the left mamma which the patient concealed from me for weeks. She was never operated upon. The fracture was slow to unite, her appearance suggested cachexia, and when pressed closely, but only then, did she show me her breast. I had noticed that although an elderly married woman, her breast was always artfully concealed even when my dressings were applied. I thought I had never seen one so modest. When I saw a large mass ready to ulcerate the reason for the slow union of her fracture was apparent.

The other was a maiden lady, fifty-five years of age, the daughter of a prominent surgeon and the sister of a physician. Although she knew of a tumor in her breast for twenty years she never mentioned it to either father or brother. When she came to my office with a younger but married sister she would not allow

her to enter my consulting room. She explained to me that she had kept it a secret from her family and friends and had only been made to seek advice on account of the very rapid growth of the mass during the previous few months. It was not painful. Sarcomatous degeneration of a benign tumor seemed clear. After much insistence she accepted operation. It proved to be sarcoma. In six months she began to complain of rheumatism in her right hip. In time a tumor of the femur, showing in Scarpa's triangle, developed and before her death attained large size. There was never local recurrence. I was absent from Louisville when she died and no autopsy was made.

I have reported these cases and could cite others to show how frequently, and how early metastases to the osseous system may take place. So unhappy has been my experience of them that when one of my operative cases, which I had considered relatively safe, begins to complain of intercostal neuralgia, backache, or rheumatic pains uninfluenced by antirheumatic treatment, I am disposed to throw up my hands and await the inevitable.

I expressed this opinion to the late Maurice H. Richardson, who was at the clinic above referred to and who spent four hours with me examining all the patients, gross specimens and microscopical slides. He agreed with me that the bones were more frequently involved than is generally believed and said that his experience had been much as my own. America has produced few surgeons with so wide an experience, who observed and thought so accurately and who always reported his convictions so conscientiously. One always felt after Richardson had spoken on a subject that the last word had been said.

But unexpected manifestations, such as above detailed, in a disease so protean in its nature as cancer, while discouraging, should also emphasize the necessity for earlier operation. There was a time when every one of the cases I have referred to could have been saved. A time when the original focus in the breast was inconceivably small, a diseased cell, a germ, something, we know not exactly what, but we do know that

for a time it is strictly local. It may remain so for weeks, months or years, varying with the organ affected, the abundance of its lymphatic supply and possibly other influences of which we know little. The evidence that carcinoma is at first strictly local is so complete and overwhelming as to leave no possibility for doubt, if one carefully considers it and is uninfluenced by the masters of a former generation, who were as slow to acknowledge and put into practice the discovery of Moore as they were to accept the inestimable blessing offered to them by Lister.

If the disease were constitutional one could never hope to effect a cure by local measures, and so long as they were practised in a partial, incomplete, and faint-hearted manner upon unfavorable cases a cure practically never resulted. But when operative limits were extended even unfavorable cases were sometimes, but rarely, cured. More extensive procedures upon average cases brought a still greater measure of success, and now, free removal of early lesions is generally followed by a permanent cure. Operations for mammary cancer yield 80 per cent. of cures if practised before the disease has spread to the nearest lymph-nodes, and a larger per cent. of early, strictly local carcinomata of the lip and larynx yield to excision. According to Judd, 93 per cent. of the traced cases of epithelioma of the lip at the Mayo clinic were permanently cured. Sir Felix Simon reports 85 per cent. of cures in local laryngeal growths.

But, unfortunately, there is no way by which a clinical diagnosis of cancer can be made with certainty even after it has ceased to be strictly local; much less can it be done beforehand. Taking all cases as they present themselves to us at the present time—early or local ones, fairly early or those with moderate involvement of the nearest chain of nodes, and unfavorable or late ones, in other words, where there is greater infiltration of the tissues around the original focus and more extensive glandular infection, but still safely removable by the knife—we must be content with a number of five-year cures ranging from 10 to 50 per cent. and upward, varying with

the organ, variety of growth and whether the part affected is deep or superficial. For example, carcinomata of the alimentary tract from mouth to anus are permanently curable in about one-fourth of the cases (Butlin, Kocher, and Mayo); whereas carcinomata of the mammary gland give upward of 50 per cent. of five-year cures (Cheyne, Dennis, Rodman).

It is true that I have selected the best available statistics, as we will never be stimulated to greater endeavor in any other way. We want and should only be satisfied with the best, not average results.

Great an advance as this is over what was accomplished formerly, we cannot view existing conditions with indifference and should aim at something which will save nearly all, instead of half our patients. There is but one way in which it can possibly be done, and that is by operating in the precancerous stage. I am well aware that the term "precancerous" will be objected to for at least two reasons: first, that there is not always a precancerous stage; second, that when it does exist it does not necessarily mean that cancer must eventuate. Both objections are granted. The term is a convenient one, however, and in the lack of more accurate knowledge as to the exciting cause of cancer we are justified clinically in its use. I had hoped to show, and will do so in a future communication, that there are definite conditions precedent to carcinomata, variously situated, far more frequently than has been appreciated.

These conditions may be internal as well as external, and are frequent and suggestive enough to warrant the term "precancerous" and, when encountered, demand a more radical treatment than has hitherto been accorded them. Furthermore, that prompt and efficient means, entirely within our reach, nearly always either cure incipient carcinomata or, what is still more desirable, prevent them. Moreover, and it is to say the least suggestive, that such precancerous conditions are inflammatory, inasmuch as a mild, low-grade, chronic inflammation, due to long standing irritation and resulting in either ulceration, hyperplasia, or cicatricial tissue, is present in all of them.

This, in turn, means diminished arterial supply with lessened physiologic resistance of the cells undergoing metaplasia. While there may be in addition something more necessary, extrinsic or intrinsic, to initiate the cancer process, this much is always present, a suitable soil, if you please, and would seem enough in itself to cause cancer.

The past month has been a notable one in bacteriology, inasmuch as Noguchi and Flexner, of the Rockefeller Institute, have definitely reported the discovery of the germs causing rabies and infantile paralysis respectively. Cancer may be the next enemy to capitulate, and, if so, let us hope that it will be to either one of these distinguished investigators, or some fellow countryman.

And yet it does not follow that a positive demonstration of the microbic origin of carcinoma will be immediately, or soon, followed by the discovery of a cure. Let us not forget that for more than thirty years the cause of tuberculosis has been known, and yet a remedy for it has not been found. Let us also hold fast to that which is good and known to be effective, early and radical operation, and, keeping constantly before us the unpleasant fact that the cancer menace is an ever-increasing one, in this and every country, threatening, though not so frequently, the young as well as those of middle and maturer years, and the further fact that its diagnosis in the incipient stage is difficult always, and oftentimes impossible, will not our most fruitful results unquestionably be in the direction of preventive rather than curative operations?

## THE LOCALIZATION OF FOREIGN BODIES WITHIN THE TISSUES, WITH A DESCRIPTION OF A METHOD OF LOCALIZATION.

BY ALFRED J. BROWN, M.D.,

OF NEW YORK CITY.

Adjunct Assistant Attending Surgeon, First Division, Bellevue Hospital; Instructor in Anatomy, Columbia University.

OFTENTIMES the search for a small foreign body within the tissues is protracted and fraught with considerable difficulty in spite of the fact that its position may have been accurately determined theoretically by one of the present methods of localization. These methods are rather complex and require careful mathematical calculation and, some of them, special instruments. Consequently a simple clinical means would seem to be desirable.

A review of the methods thus far described for locating accurately foreign bodies within the tissues of the body allows them to be divided into two classes: 1. The localizing of the foreign body, if metallic, by the electric searcher, and 2, localization by stereoscopic radiography.

1. *Localization by the Electric Searcher.*—The metallic electric probe has been in use for many years but it is of value only in cases in which there is an open tract leading down to the foreign body. As a result the instrument is useful chiefly in gunshot wounds.

Thomas,<sup>1</sup> for locating metallic foreign bodies, makes use of a telephonic searcher. This consists of three needles mounted on a handle and so wired that contact of any two of the needles with a metallic object completes an electric circuit and rings a bell. The instrument is advocated as an aid in operation and is used after an incision has been made through the skin. The needles are thrust into the tissue in various directions until the foreign body is encountered. Immediately upon touching the foreign body the bell rings, the sound being

transmitted to the ear of the operator through a telephone receiver. The current is turned off, searcher left in place, and the foreign body cut down upon, using the needles as a guide.

2. *Stereoscopic Radiography*.—Cole<sup>2</sup> reviews the methods of radiographic localization and goes on to describe his own. Two separate radiographs are taken. One to locate the position of the body and one for measuring its depth from the surface. In the first plate two coins are placed on the part, one on the anterior and one on the posterior surface, in such a way that the rays from the anode will pass through coins and foreign body and the three objects will cast but a single shadow upon the plate. When these conditions are fulfilled the position of the coins is marked upon the skin with silver nitrate. The body must lie upon a line projected through the two coins. In order to ascertain the line with accuracy the coins must be placed under the fluoroscope or several attempts with skiagraphs may be necessary, each time moving the coins until finally all three bodies cast a single shadow. In order to determine the depth of the foreign body from the surface, two exposures are made on a single plate. After the first exposure the tube is moved a short distance, the distance noted and a second exposure made. The skiograph shows two shadows of the foreign body. By measuring the distance between the shadows on the plate, the depth of the body in the tissues can be determined accurately by means of the following fixed quantities: (a) distance of anode from plate, (b) distance between anodes at the two exposures, (c) distance between the shadows cast in the two exposures.

The above method embodies the principle employed in locating foreign bodies in the tissues by the X-ray, namely, triangulation of the planes of the shadows cast by the foreign body with the tube in two different positions. Brickner<sup>3</sup> modifies the method somewhat and makes use of special apparatus. Sweet<sup>4</sup> employs a rather complex apparatus and calculates the position of the foreign body by the relation between its shadow, that of a fixed marker on the upper surface of the part and that of a pair of crossed hair lines lying on the surface of the

photographic plate. Fürstenau, cited by Reichmann,<sup>5</sup> has perfected a special instrument (*roentgentiefenmesser*), by which the depth of the foreign body and its position with relation to a surface marker can be read off upon a scale. The instrument is made in the form of a pair of calipers with two arms, and carries two scales.

The above methods leave nothing to be desired in the way of theoretical accuracy. They are, however, very exacting technically and, on account of the special instruments required, it is not always feasible to carry them out. Measurements are, as a rule, made from fixed bony points and this allows for the possibility of two forms of error. The distance from the shadow cast by the bony point to that cast by the foreign body does not correspond to the distance between the actual objects in the living body. The reason for this has been pointed out by Cole.<sup>2</sup> There is also the error due to personal equation between radiologist and surgeon in taking the measurements. A further difficulty for the surgeon presents itself in that in some of the methods there is no mark upon the surface of the body to follow at the operation, and in others there is only a small silver nitrate spot.

The following method of localizing foreign bodies is suggested as being simple, accurate, and requiring no apparatus beyond the usual X-ray outfit.

*Technic.*—A preliminary radiographic examination for the purpose of substantiating the diagnosis is made and the approximate position of the foreign body noted. The area of skin over the foreign body and a surrounding area of a few inches is then prepared in the following manner: Vertical and horizontal lines running at right angles to each other are painted upon the skin with silver nitrate solution, thus laying the skin out into squares (see Fig. 1). The size of the squares can easily be made to bear a proper relation to the size of the foreign body on the one hand and that of the part to be prepared on the other. As a rule, one inch squares will be found very convenient. The component lines of the checker board thus formed are numbered for the purpose of more easily locating the individual squares. The

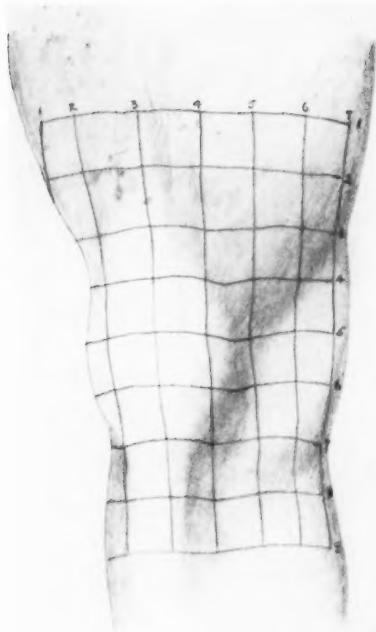
area thus painted should include one-half the circumference of the part. As an example, in the knee the first vertical line should run along the antero-internal margin of the knee and the last along the postero-external. The horizontal lines should connect the vertical. If the entire circumference is laid out in squares, the lines of one-half the circumference should be solid and those of the other half dotted. The reason for this will be apparent. The silver solution is allowed to turn black and the skin thus stained. The lines are then painted over with white lead paint and this allowed to dry. Two radiographs are now taken, one, anteroposteriorly and one, laterally, the target of the tube being placed directly over the position of the foreign body as shown in the preliminary skiagraph. The resulting skiagraphs show the shadow of the foreign body with relation to the squares painted upon the skin. By projecting imaginary lines from the shadow of the body in the two positions with relation to the overlying lines, its approximate depth from the surface is easily calculated. If the entire circumference of the part has been painted, the position of the body is noted accurately by projecting the point of intersection of the shadow with the solid line on one surface to its point of intersection with the dotted line on the opposite surface. If desired, a tracing of the lines and the shadow of the body may be made on a transparent paper and this tracing laid upon the skin so that the lines of the squares correspond accurately. The shadow of the foreign body may then be marked upon the skin with silver nitrate to be used as a guide at operation. Following the radiographic examination the white lead is removed and the part placed at rest until operation.

This method has been employed in three instances in the First Surgical Division of Bellevue Hospital, New York City, in the services of Drs. John B. Walker and Lucius W. Hotchkiss, to whom I am indebted for the privilege of making this report.

In each case the foreign body (a needle) had moved a considerable distance from its point of entrance and in none of the cases could it be palpated.

CASE I.—*Needle in the knee* (Figs. 2 and 3). One month before admission the child fell, driving a needle into her knee. The knee is held in flexion of 160° and extension is painful. After radiographic localization an attempt to remove the foreign body by operation was made and after a search of fifty minutes

FIG. 1.



Knee showing lines painted upon surface.

FIG. 2.



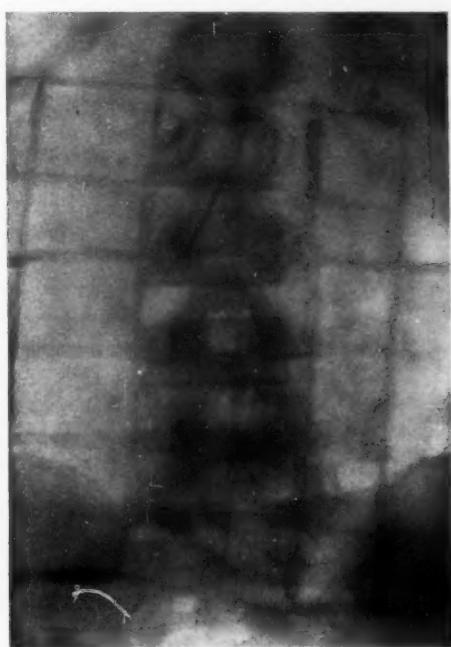
Case I. Anteroposterior view of knee.

FIG. 3.



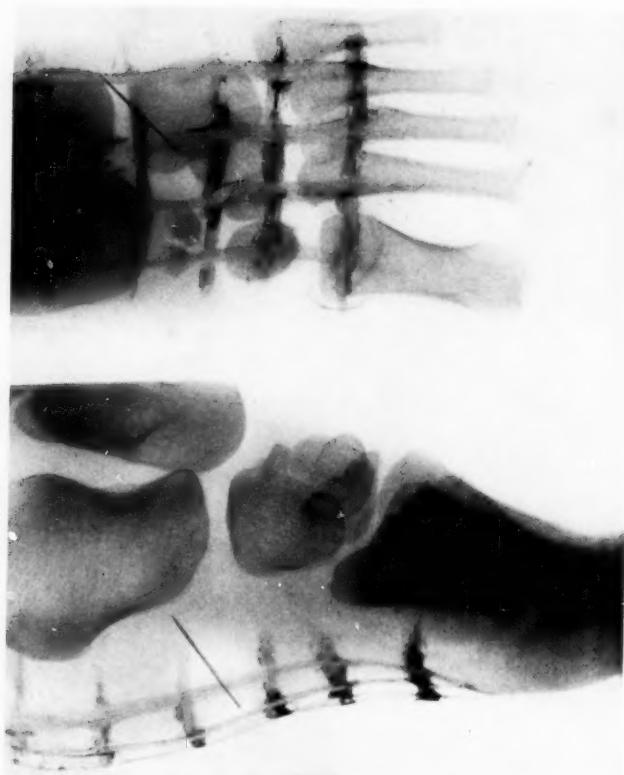
Case I. Lateral view of knee.

FIG. 4.



Case II. Needle in the back.

FIG. 5.



Case III. Anteroposterior and lateral views of foot.

it was given up. Subsequent to localization by the method above described, an oblique incision across the shadow of the needle in the appropriate square resulted in its removal. The entire time of operation, including the joint repair, was fifty minutes.

CASE II.—*Needle in the back* (Fig. 4). Two weeks before admission a child thrust a needle into the patient's back and the needle broke. The point of entrance was situated on the left side about two inches outside the outer border of the erector spinae muscle. The radiograph taken after the skin had been marked out into squares showed the needle lying approximately in the long axis of the body near the spinous process of the third lumbar vertebra and traversing the longitudinal extent of one square. An incision over the appropriate square disclosed the needle lying beneath the aponeurosis in the substance of the erector spinae muscle. It was recovered at operation in five minutes.

CASE III.—*Needle in the foot* (Fig. 5). This case disclosed the fact that it is necessary for the operator to know the position of the tube at the time of skiagraphic examination. Five days before admission the child stepped upon a needle, driving it into the sole of the foot and breaking it off. The point of entrance was half an inch external to the inner border of the foot and half way from the posterior border of the heel to the first metatarsophalangeal articulation. Skiagraphic examination, after the skin had been prepared according to the above method, showed the needle obliquely placed, nearer the outer border of the foot than the inner and lying across two squares, the base of the needle about half an inch from the surface. As the X-ray tube could not be placed directly above the foot when taking the skiograph because of the presence of the leg the rays met the photographic plate at an oblique angle. As a result the shadow of the needle in its relation to the surface lines was shifted because the surface lines rested directly upon the plate while the needle was deeper in the tissues and consequently farther away, hence, the rays had to travel a distance of from half an inch to an inch in an oblique direction before striking the plate. During the first part of the operation this was not taken into account, but when the needle was not found immediately, the source of error was recognized and a slight lengthening of the incision in the proper direction resulted in the finding of the needle. Time of operation, twenty minutes.

It is in such a case as this that the painting of the part over the entire circumference will prove of value as it will allow of through-and-through projection of the shadow from a fixed point on one surface to a fixed point on the other.

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## PNEUMOCOCCIC ARTHRITIS.

BY KENNETH BULKLEY, M.D.,  
OF NEW YORK.

PNEUMOCOCCIC arthritis is a comparatively rare disease. Were it not for this fact we would feel some hesitancy in writing a paper following but one observation. However, in attempting to obtain data, we found that the statistics given were somewhat misleading, due no doubt to the compilation of a relatively small number of cases. This led us to review the cases already collected and to collect such additional as were available, including, as far as possible, only those cases in which the arthritis was proved to be due to the pneumococcus. For this reason a number of reports found in previous compilations will be found missing from this paper.

The excuse for this paper and the material on which it is based consists of reports of 172 cases collected from the literature to which we have added one case coming under our own observation. The history of this case is as follows:

J. B., male, age eleven months, fourth child. Normal birth, breast fed for three months. Well until 4½ weeks ago when he developed a left lower lobe pneumonia. During the course of this pneumonia the right shoulder became somewhat swollen and tender. The swelling increased slowly until three days before admission, but since then the increase has been rapid.

Patient admitted to the Presbyterian Hospital, where he was first seen by the writer, on March 28, 1911. Examination showed a poorly nourished child, otherwise apparently healthy except for the local condition. At the site of the right shoulder was a rounded swelling occupying largely the anterior and lateral aspect of the joint. Skin over it white, but numerous large dilated veins were evident. Swelling was about the size of a mandarin orange, soft, fluctuating, and moderately tender. No crepitus. Length of arm normal. Motion of arm limited, apparently by pain. Temperature 101.2°, pulse 142, respiration 36. Leucocytes 34,000,

polymorphonuclears 78 per cent. Cultures from throat showed staphylococci and pneumococci.

On the day after admission the shoulder-joint was aspirated and 130 c.c. of greenish-white creamy pus was obtained. Cultures from this showed a pure growth of pneumococcus. The joint was again aspirated on the following day, and 2 per cent. formalin in glycerin injected. As the child was becoming progressively worse, temperature 104°, an arthrotomy under cocaine was done on the anterior aspect of the joint, and considerable pus and fibrin were obtained. The structures within the joint felt normal to the palpatting finger. The accompanying temperature chart shows the

FIG. 1.

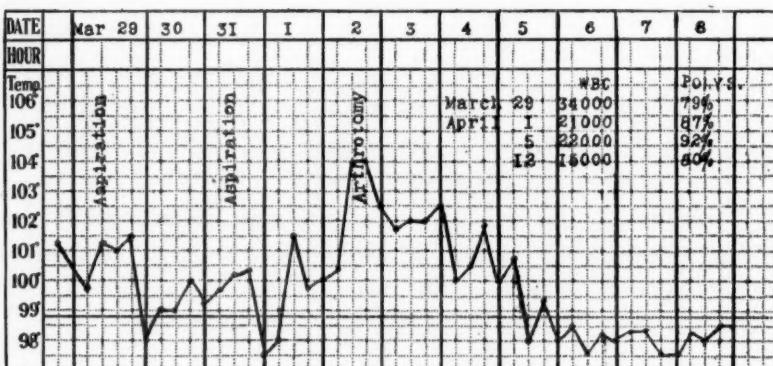


Chart of author's case. Note sudden fall of temperature after each aspiration and the rapid permanent fall after arthrotomy.

course of the disease. The drainage, at first profuse, gradually decreased, and on the eighth day the rubber drainage tubes were removed. Convalescence was uneventful and the wound rapidly closed. Some months later function was perfect and no limitation of active or passive motion could be detected.

*Historical Note.*—The pneumococcus was first discovered by Sternberg in 1880. In 1881 Volpian again described it in the sputum, and in the same year Ebert and Koch and in the following year Friedlander, Leyden, and Gunther showed it to be constantly present in the lungs of persons dying with lobar pneumonia. It was not until 1884 that Salmon first successfully isolated it in pure culture on artificial media. In the fol-

lowing years many authors described the presence of the pneumococcus in nephritis, meningitis and endocarditis complicating pneumonia, but credit for first finding the organism in the joint fluid is usually given to Foa and Bordoni-Uffreduzzi <sup>39</sup> (1888).

The first completely reported case of arthritis in which the pneumococcus was isolated from the joint was described by Weichselbaum <sup>137</sup> in 1888 although undoubted cases lacking bacteriological proof had been previously reported by Fournet (1839), Grisolle <sup>52</sup> (1864), Bouchard (1881), Maragliano <sup>83</sup> (1882), Bourcey <sup>16</sup> (1883) and others. Since Weichselbaum's paper many cases have been reported and not a few notable monographs placed on record. Leroux, <sup>75</sup> in 1899, collected 28 cases to which Cave, <sup>21</sup> in 1901, added 3, Cole, <sup>26</sup> in 1902, added 9, Herrick, <sup>56</sup> in 1902, added 21 etc., etc. Other notable contributions have been made to the subject by Pfisterer, <sup>104</sup> Herzog, <sup>57</sup> Gasne, <sup>46</sup> Zesas, <sup>144</sup> and other writers.

#### ETIOLOGY.

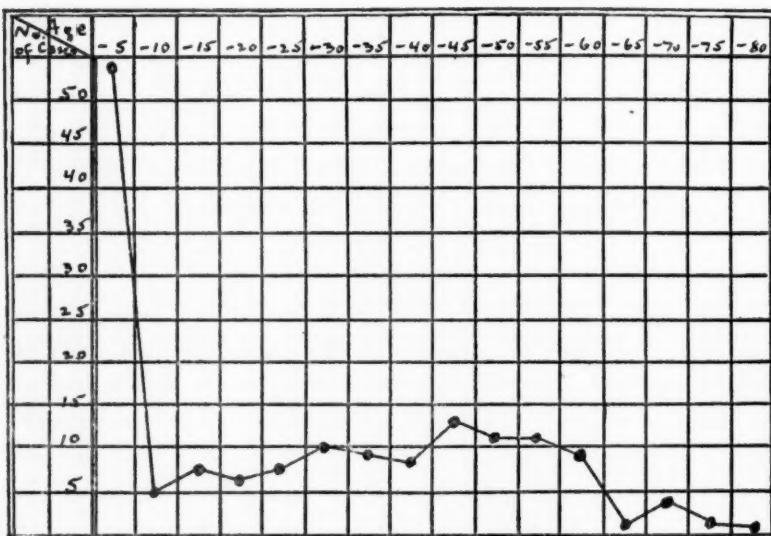
*Incidence.*—That the condition is a rare one is shown by the comparatively few cases on record. We have been able to collect only 172 cases although the condition was first described 25 years ago. Its frequency in relation to pneumonia is generally given as about one in eight hundred, Table I showing one arthritis in each 727 of a total of 12,364 cases of pneumonia collected. Raw <sup>111</sup> found the remarkably high figure of 1 per cent. in his London cases, but the majority were alcoholics, a condition predisposing to arthritis.

TABLE I.  
*Number of Cases.*

Reporter.	Source.	Pneumonia.	Arthritis.
Herrick.....	Collected from German Clinics.....	2,292	2
Vogelius.....	Charite, Berlin .....	3,293	2
Vogelius.....	Munich Hospitals .....	650	1
Vogelius.....	Paris Clinics .....	1,215	3
Leroux.....	Collected from Germany .....	4,256	6
Chatard.....	Johns Hopkins Hospital .....	658	3
		—	—
		12,364	17

*Age.*—The condition was first described as one of late adult life. Gasne,<sup>46</sup> however, in 1908, was able to collect 52 cases in children under 2 years of age, and in our series 53 cases or 34 per cent. have occurred during the first hemidecade. It is unfortunate that Gasne did not publish the details of his cases, as many of them we have been unable to trace. Fig. 2 represents graphically the age incidence. The youngest case in the series was 11 days old and the oldest 79 years.

FIG. 2.



Showing the number of cases occurring in each hemidecade.

A close survey of the chart shows a large number of cases under the age of five years, a sudden fall, then a gradual increase up to the twenty-fifth year. A rather uniform number occurs during each five year period from then until the sixtieth year, when the number of cases rapidly decreases. We can thus accurately state that the disease is more common during infancy than in any other period of life, a statement which, in 1910, Howard<sup>63</sup> thought we were not warranted in making. Herzog<sup>57</sup> believes that children are particularly susceptible to pneumococcus infections of all sorts, and particularly to arthri-

tis. Dudgeon and Branson<sup>30</sup> have shown that while suppurative arthritis is uncommon during the first 6 months of life, the causative agent is in the majority of cases the pneumococcus. Herzog<sup>57</sup> explains the frequency of infective arthritis in infants by the peculiar structure and vascular arrangement of the bony rudiments of the joint. He quotes Neumann who has shown that the capillaries of the bone marrow in infants are of larger calibre than the smallest arteries, an arrangement whereby the blood current is rendered extremely slow and the deposition of infective organisms in the tissues is favored. The number of cases occurring between the ages of 25 and 60, the period of greatest activity, is probably explained by trauma, etc., a point which we will later discuss in detail.

*Sex.*—There were 102, or 65 per cent. males, and 53, or 35 per cent. females, in our series. In 18 cases the sex was not mentioned. Earlier writers have all given a still higher proportion of males. This disproportion has usually been ascribed to the influence of trauma which unquestionably, predisposes to infection and to which the male is more subject than the female. In order to determine this point we have analyzed the sexes above the age of 10 years, assuming that below that age trauma plays an indifferent or at least an impartial rôle. We found approximately 78 per cent. males and 22 per cent. females, quite a contrast with our original figures of 65 per cent. and 35 per cent., respectively!

*Predisposing Factors.*—Besides the acknowledged fact of the lack of resistance of synovial membranes to infection, there is strong evidence that partial immunity of the host or decreased virulence of the organism play their part in the joint localization. Bezancon and Griffon,<sup>11</sup> working with the pneumococcus, were unable experimentally to produce alone an arthritis in rabbits without first partially immunizing them by repeated inoculation of non-virulent cultures. They concluded that pneumococcus arthritis was more apt to appear with a culture attenuated by age, or by an enormous dose into an animal rendered relatively immune by previous vaccination. Lippmann<sup>78</sup> believes that a pneumococcus of feeble power having

broken into the circulation is unable to produce a generalized infection, is repelled by the stronger tissues, and finally gets a foothold on a serous articular surface. This theory is supported clinically by our statistics. In 73 cases of our series in which the arthritis followed a pneumonia eleven days was the average time elapsing between the onset of the pneumonia and that of the arthritis. This is exclusive of two cases (Popescu<sup>107</sup> and Schuster<sup>110</sup>) in which the arthritis followed the pneumonia four months and 20 years respectively. This long period before the onset of the arthritis argues strongly in favor of the development of a partial immunity, or of an organism of decreased virulence, or both.

*Trauma and previous joint disease* unquestionably play their part also, as is shown by both experimental and clinical evidence. As to experimental evidence we can do no better than quote the summary made by Cole,<sup>26</sup> of work in this line. It is as follows: 1. Injection of virulent cultures of the pneumococcus into the joint of a susceptible animal is almost always followed by acute suppurative arthritis. 2. Subcutaneous injections after previous excitation of an aseptic inflammation of a joint give results some positive and others negative. 3. Intravenous injections (with conditions as in 2) are more apt to give a positive result. The first condition we have not encountered in the literature, no cases of punctured wounds of joints followed by pneumococcus arthritis having been found. Neither have we encountered the second condition in which a subcutaneous infection by the pneumococcus has given rise to a pneumococcus arthritis, although a number of cases of cutaneous and subcutaneous infection (Judd,<sup>65</sup> Powers<sup>108</sup>) have been reported. The third condition is reproduced almost identically in man, for Rosenow<sup>115</sup> was able to demonstrate the pneumococcus in the circulating blood in 91 per cent. of 175 cases of pneumonia. And this is where trauma and previous joint disease play their part. In 24 per cent. of our cases we have found cause for a *locus minoris resistentiae*. This figure is lower than those given by Leroux,<sup>75</sup> Cave,<sup>21</sup> Cole,<sup>26</sup> Pfisterer,<sup>104</sup> and Herrick,<sup>56</sup> but, nevertheless, we consider it

high enough to definitely indicate the rôle played by trauma, previous joint disease, and chronic systemic infection and poisoning. The conditions mentioned were as follows:

Rickets .....	4
Previous tuberculosis of joint .....	1
Injury .....	6
Alcohol and injury .....	2
Rheumatism .....	11
Injury and rheumatism .....	2
Plumbism .....	2
Gout and plumbism .....	2
Previous typhoid arthritis .....	1
Syphilis .....	4
Alcoholism .....	9
Marasmus .....	1
Gout .....	1

*Relation to Pneumonia.*—The cases may be classified according as to whether they have occurred during or after a pneumonia (meta- or postpneumonic), before a pneumonia (prepneumonic), or independently of any inflammatory lung lesion. Our cases may be divided as follows:

Following a pneumonia .....	73
Preceding a pneumonia .....	5
Pneumonia associated with arthritis but relation not stated....	38
No pneumonia .....	48
Presence or absence of pneumonia not stated.....	9

173

It is thus seen that 70 per cent. of the cases are associated with a pneumonia, and that 93 per cent. of these follow and 7 per cent. precede the lung lesion.

The meta- and postpneumonic cases are thus in the vast majority, Bourcey<sup>16</sup> considering that most of them occur during the stage of red hepatization. The duration of time between the onset of the pneumonia and that of the arthritis varies from one day to 20 years (Schuster<sup>119</sup>), and averages (excluding the long cases of Schuster,<sup>119</sup> 20 years, and Popescu,<sup>107</sup> 4 months) about 11 days, arthritis being more liable to follow a pneumonia in adults than in children.

The prepneumonic cases are rare, Howard<sup>63</sup> even considering their occurrence questionable, but we have encountered five and must accept them. In two cases the pneumonia is described as occurring a few days after the arthritis, in one case as 4 days, one as 5, and one case (Furrer<sup>41</sup>) as occurring six months after the arthritis. To us it seems quite possible that the usual routine should be at times reversed, the joint becoming infected first and the lungs later. We do not consider these, however, to be necessarily cases of primary pneumococcus infections of joints, but rather as cases in which the coccus has gained entrance to the blood stream either through the lungs, tonsils, pharynx, middle ear, or vagina, etc., causing lesions clinically undetected.

The cases not associated with any pulmonary involvement are of more interest and comprise the surprisingly large figure of 29 per cent. of our series, this condition having been found 48 times. Of these, 27 cases, or 59 per cent., occurred in children under ten years of age and 19, or 41 per cent., in older individuals. In the first group a primary localization of the pneumococcus is mentioned in 55 per cent. of the cases, while among the older individuals it is noted in but 36 per cent. Of the 48 cases not associated with pneumonia only 18 are noted as having some focus of pneumococcus infection previous to that of the joints. It will be noticed that most of the cases (15 out of 22) in which the primary focus was discovered were in children. These are as follows:

Infection of harelip wound (infant) .....	1
Conjunctivitis (infant) .....	1
Measles (infant) .....	1
Varicella (infant) .....	1
Bronchitis (infant) .....	2
Influenza (adult) .....	1
Cystitis (adult) .....	1
Pyosalpinx with umbilical fistula (adult) .....	1
Enterocolitis (infant) .....	2
Tonsils and pharynx (adult 1, and infant 2) .....	3
Suppuration at umbilicus (infant) .....	1
Abscess of thigh (infant) .....	1
Otitis media (infant 3, adult 2) .....	5
Labor and peritonitis (adult) .....	1

In the remaining 26 cases we believe that the primary focus or point of entrance of the organism was not found, but was nevertheless present. These cases have often been classed as primary and possibly correctly so. Allen and Lull<sup>3</sup> reported their case in 1901 as the first primary case on record, while a year later Cole<sup>26</sup> classified 9 cases as primary. The question is largely an academic one hinging on whether the pneumococcus can traverse a mucous membrane without causing a lesion of the same, or whether this lesion if present shall be called the primary focus and be disregarded. For our part we prefer to consider all the cases as secondary, arguing that the joint can only be infected through the blood or lymphatic streams and that the organism in order to reach either of these systems must traverse the epithelial covering of the body, either skin or mucous membrane, and in so doing cause a lesion, no matter how small, which actually is the primary focus.

#### PATHOGENESIS.

In the meta- or postpneumonic cases the portal of entry is unquestionably the respiratory tract. In the prepneumonic cases and in those not associated with a pneumonia the point of entry is varied. In many cases it cannot or is not found, 29 of our 47 cases. Probably in the majority of these cases, as pointed out by Herzog,<sup>57</sup> the portal of entry is the middle ear. Especially is this true in children. Zeufel (quoted by Howard) found 40 per cent. of the cases of otitis media in children to be due to the pneumococcus. Reference to page 78 shows the portals of entry which we have encountered. Three reports are particularly worthy of mention. In Nattan-Larrier's<sup>94</sup> case a pneumococcus arthritis of the shoulder followed the infection of an operative harelip wound, the organism being recovered from the pus in the joint and from the wound. In Low's<sup>80</sup> case a multiple arthritis from which the pneumococcus was recovered was secondary to a primary hemorrhagic ulcerative pneumococcus cystitis. In Cohen's<sup>26</sup> case the arthritis

followed a double pyosalpinx with operation followed by umbilical fistula, but unfortunately the bacteriology of the pelvic process was not known. The general statement can be made that the portal of entry is usually one of the mucous membranes associated with the structures connected with the mouth, nose, or pharynx. Hirschberg<sup>59</sup> has recently reported a series of 43 cases of malignant pneumococcus tonsillitis in which 7 per cent. of the cases developed an arthritis.

That the path of infection from the point of entrance to the joint is usually the blood stream is readily understood when we consider the findings of Rosenow,<sup>115</sup> already quoted. We unfortunately did not analyze our cases in regard to lymphatic extension and so can only quote Pfisterer,<sup>104</sup> who found that in 7 cases of unilateral pneumonia, the shoulder-joint in all and the sternoclavicular joint in 3 cases were affected on the same side. Netter<sup>95</sup> also believes that lymphatic transmission of the infection occurs. We believe with Howard, however, that the blood stream is the usual path of infection.

#### PATHOLOGY.

One or more joints may be involved, but the majority of cases are monarticular. Of our cases subject to analysis 75 per cent. were monarticular and 25 per cent. polyarticular. The right side (57 per cent.) was involved more frequently than the left (43 per cent.). The lower extremity was implicated far more frequently than the upper, the knee in the lower and the shoulder in the upper extremity being the two joints most often affected. The accompanying table represents in brief form the frequency of involvement of the various joints.

Temporomaxillary .....	1
Upper extremity	
Sternoclavicular .....	12
Shoulder .....	41
Elbow .....	18
Wrist .....	22
Metacarpophalangeal .....	3
Interphalangeal (hand) .....	1 97

## Lower Extremity

Hip .....	23
Knee .....	83
Ankle .....	20
Metatarsophalangeal .....	4
Small joints of foot (one case).....	1 131
Multiple (4 cases) .....	4
	—
	233

Of the single joints affected the knee holds first place, while practically all the monarticular cases have been either the sternoclavicular or one of the large joints. It is interesting to note that not a single case of infection of the acromioclavicular joint or of the vertebral column has been reported, and only one of the temporomaxillary joint.

The process has been suppurative 147 times, serous 15 times, suppurative and serous combined twice, and in 9 cases the data is insufficient. These figures are, however, somewhat misleading for we have encountered many cases in the literature in which the process has evidently been serous, usually in the course of a pneumonia, but in which the joints were not tapped or the fluid was not examined bacteriologically. Such cases we have of course been unable to include. Many of them are possibly examples of the so-called toxic arthritis, but we believe that the majority are cases of septic serous arthritis, pneumococcic in content, often disappearing without treatment and examples of active acquired immunity. We base this belief on the large number of such cases which have been aspirated and in which the pneumococcus has been recovered from the fluid. But even so, the majority of infectious pneumococcus joints are unquestionably suppurative in character.

The conditions found within and about the joints are essentially those of any other septic arthritis. The exudate varies from a serous to a serofibrinous or serosanguinous fluid to the more commonly found thick, creamy, greenish pus. We quote Cave:<sup>21</sup> "The organism is found in the fluid exudate, either free or embedded in larger cellular elements, and a thin layer of cocci may exist on the free surface of the fibrinous layer

which covers the inflamed synovial membrane. Deeper parts of sections, whether synovial membranes, cartilage, or bone, show as a rule no micro-organisms. The synovial membrane is thickened, irregular, and sections show two layers of about the same thickness: the deeper, vascular and infiltrated with embryonal cells embedded in a meshwork of connective tissue; the superficial consisting of a network of fibrin arranged for the most part parallel to the free surface and containing leucocytes in the interstices. In mild cases or those of short duration the synovial membrane alone may be affected with loss of polish and injection of the fringes. But in many the cartilage is partially or completely eroded and the surface of the bones is laid bare. In the older or more virulent cases the changes are much more destructive, the ligament and cartilage being completely destroyed, as also in some cases the articular ends of the bones. The pus may perforate the capsule and penetrate several inches along the intermuscular planes or sheaths of the tendons." These destructive changes are well illustrated in the cases of Fernet and Lorraine<sup>36</sup> in which the joint could scarcely be recognized, and of Picque and Veillon<sup>105</sup> in which the pus burrowed upward from the knee along the femoral artery for six inches and downward between the muscles of the calf. In Slaughter's<sup>125</sup> case also much extra-articular damage was found. Gasne<sup>46</sup> believes that in many of the cases in infants not associated with a pneumonia the primary focus is often bony rather than arthritic. He says that in opening these joints we should look carefully for some small focus occurring in one of the bones entering the joint not covered with hyaline cartilage but lying inside the capsule.

#### SYMPTOMATOLOGY.

The symptoms vary but little from those of any other septic arthritis. No one picture representing the disease in all its various phases can be drawn. Locally there is discomfort which may vary from a mere twinge of pain to pain so excruciating that the slightest touch or motion of the joint may render it well-nigh unbearable. Loss of function invariably

accompanies the pain. Swelling is variable depending on the amount of fluid and whether the capsule is or is not perforated. The joint may not be discolored, the skin over it being normal, but redness and oedema always accompany periarticular involvement. In the chronic cases the skin may be white and show large, dilated veins. Tenderness is, of course, marked, but it is diffuse over the joint, so failing to show localized osseous involvement. The presence of crepitus has not been noted.

The general picture is usually that of a severe toxæmia but many cases are recorded in which the process has been so chronic that a tuberculous or gonorrhœal joint has been suspected. At the other extreme are exceedingly virulent cases in which the picture is that of an acute, overwhelming infection rapidly terminating in death. Such a case is that reported by Pitt<sup>106</sup> in which the patient died in 48 hours after the onset of the first symptom. The majority of cases fall midway between these two extremes. The temperature is moderate not often rising above 102 to 103°, accompanied by a corresponding increase in the pulse rate. Uncomplicated cases are not excessively sick. In children the general condition seldom keeps pace with the local condition, and a child with a joint full of pneumococcus pus may be bright and eat and sleep well.

In the complicated cases the picture is usually that of severe general sepsis with high fever, rapid pulse, great prostration, chills, and sweats. Such symptoms seldom occur except in the presence of complications and are the result more of the complications than the accompanying arthritis.

#### COMPLICATIONS.

In 45 per cent. of the cases (78 times) the presence of complications other than pneumonia has been noted, but this figure is probably too low, for many of the reports are incomplete. Briefly tabulated, the complications found were as follows:

Endocarditis .....	22
Pleurisy and empyema .....	19
Meningitis .....	16

Pericarditis .....	16
Septicæmia .....	10
Abscess	
Buttock .....	2
Thigh .....	4
Arm .....	2
Parotid .....	1
Thyroid .....	1 10
Otitis media .....	6
Acute nephritis .....	4
Peritonitis .....	3
General pyemia .....	2
Osteomyelitis .....	2
Splenic and renal infarcts .....	1
Septic pulmonary infarct .....	1
Septic thrombus of arm .....	1
Myositis .....	1
Cellulitis .....	1
Vaginitis .....	1
Cystitis .....	1
Conjunctivitis .....	1
Decubital gangrene .....	1

Among the cases reported within recent years many have shown a pure pneumococcus blood culture, but we have been unable to obtain definite statistics on this point.

#### DIAGNOSIS.

In most cases following pneumonia the diagnosis of pneumococcus arthritis is easy, but because of its rarity (0.14 per cent.) it may be overlooked. Localized articular pain and swelling occurring during or following a pneumonia should not only be presumptive evidence of a pneumococcus arthritis, but should be an indication for immediate exploratory aspiration and bacteriological examination of the fluid by smears, cultures, and animal (mouse or rabbit) inoculation. Only by this means can an accurate diagnosis be reached.

The disease must be differentiated from a number of conditions which it may simulate and which may also be found in connection with a pneumonia. Smirnow,<sup>126</sup> in examining ten cases of polyarthritis complicating pneumonia, found five in

which the arthritis was due to a streptococcus, staphylococcus, or bacillus typhosus, while Gabbi and Puritz<sup>42</sup> and others have reported examples of periarticular localization of the pneumococcus which have closely resembled true articular lesions. Remembering always that the ultimate differentiation must depend on bacteriological examination, there are clinical features which may at times be of service.

*Acute suppurative arthritis* due to the staphylococcus or one of the various strains of streptococci simulates closely a true pneumococcus arthritis in often occurring after a pneumonia and frequently being monarticular. The constitutional symptoms, however, are apt to be more severe, especially in children, in whom the condition is most apt to be found. Diagnostic aspiration is paramount.

*Tuberculous arthritis* will rarely cause difficulty, except in the acute fulminating cases which occur in children. Here the use of a tuberculin test will be of assistance. In older individuals the chronic course and constitutional symptoms aid in establishing a diagnosis.

*Gonorrhœal arthritis* is usually multiple and the original focus of infection can possibly be traced. The complement-fixation test, as first suggested by Müller and Oppenheim,<sup>93</sup> may give the necessary clue to the real nature of the condition.

*Syphilitic arthritis* is rare, of slow onset and of chronic painless course, almost invariably showing a positive Wassermann reaction. This is especially true of the cases of hereditary syphilis occurring in children which are most apt to be confounded with pneumococcus arthritis. The characteristic teeth, facies, and other syphilitic manifestations are also usually present.

*Acute rheumatic arthritis* is usually multiple, excessively painful, and in children frequently accompanied by endocarditis. The tendency to the involvement of new joints together with the subsidence of those joints first affected is characteristic, while the redness and extreme tenderness are far in excess of that found in pneumococcus arthritis.

In infants under one year of age *scurvy* might be suspected, but close observation will reveal the typical gums of scorbustus and the fact that the pain and swelling are not at the joint but at the epiphysial cartilage.

#### PROGNOSIS.

The prognosis, always grave, is better when only one joint is affected and complications are absent. Thus in our series, of 66 patients with a monarthritis and no other focus of infection only 24 per cent. died, while of 98 cases with multiple foci 72 per cent. died, showing conclusively that the danger lies not in the local but rather in the general infection. The prognosis is better in the younger than in the older patients. Among 69 cases below the age of 20 the mortality was 42 per cent., while among 92 cases above that age the mortality was 57 per cent. Herzog gives the mortality among infants as 39 per cent. The mortality rate of our entire series was a trifle over 50 per cent., a figure considerably below the widely quoted 65 per cent. of Herrick.<sup>56</sup>

It is quite possible for general recovery to be followed by local recovery, but statistics on this point are not available. We cannot agree with the statement frequently made that ankylosis of the joint usually results. In only 34 of our case reports is the functional result accurately stated. Of these 25 are described as resulting in good functioning joints, while in many of the reports the impression is given that the patient was left without permanent joint disability.

#### TREATMENT.

In addition to such general measures as may be indicated, there are a number of methods of local treatment which present themselves. Palliative and temporizing methods cannot be too strongly condemned. Of 19 cases in which such means were used 17 died, a mortality of 89 per cent.!

Radical treatment should be undertaken not only as soon as a diagnosis is made but if necessary should be utilized in arriving at such diagnosis. The four surgical means at our dis-

posal in the order of their severity are aspiration, arthrotomy, resection, and amputation. Briefly tabulated the results in this series of these methods of treatment were as follows:

	Number of Cases.	Recovered.	Died.	Mortality.
Aspiration .....	21	13	8	38 per cent.
Arthrotomy .....	91	59	32	35 per cent.
Resection .....	1	1	0	0 per cent.
Amputation .....	3	1	2	66 per cent.

These figures are probably somewhat misleading, for the severity of infection and the type of arthritis are not shown by numerals. Very few, if any, cases of true suppurative arthritis in which aspiration alone was done recovered. This form of treatment should be primarily diagnostic. If the fluid obtained is clear or only very slightly turbid, the aspiration should be again repeated as often as necessary. If, on the other hand, pus is obtained either by the first or by subsequent aspirations, an arthrotomy should be immediately performed. Considering the fact that the arthritis is usually only one manifestation of a general bacteriæmia, it is a question whether resection or amputation are often advisable except for correction of the resulting deformity.

And finally just a word on active and passive immunity in their relation to possible treatment. In one case arthrotomy was supplemented by autogenous vaccines, and in another case autogenous vaccines were alone employed. Both cases recovered, and while the number is insufficient for definite conclusions, they may point the way for future results possibly better than those of the past. The recent work of Wadsworth<sup>136</sup> in the treatment of pneumococcus infections in animals by immune sera is also encouraging. So far as we know the method has not yet been tried on man, but we would not hesitate to attempt it on our next case. The present mortality rate certainly cannot fail to inspire one to discover and use all means possible to achieve better results.

The writer desires to express his appreciation of the kindness of Dr. Joseph A. Blake in allowing him to operate upon and report this case.

CHRONOLOGIC TABLE OF REPORTED CASES OF PNEUMOCOCCIC ARTHRITIS.

No.	Reporter	Date	Age	Sex	Seat of arthritis	Nature	Relation of pneumonia	Complications	Treatment of joint	Functional result	Recovery or death	Remarks
1	Weichselbaum <sup>2</sup>	1888	54	..	Rt. shoulder	Pn. 3 days before	Suppurative	.....	?	.....	D.	
2	Belfanti <sup>3</sup>	1889	...	..	Rt. wrist	Pn. 11 days before	Suppurative	.....	?	.....	D.	
3	Monti <sup>4</sup>	1889	...	..	Metacarpophalangeal	Pneumonia	?	.....	?	.....	D.	
4	Popescu <sup>107</sup>	1889	60	M	Rt. knee	Pn. 4 months before	Suppurative	Ulcerative endocarditis. Septic pulmonary infarct	?	.....	D.	Knee injured 2 weeks prior to pneumonia.
5	Lannelongue <sup>2</sup>	1890	19	M	Rt. hip	None	Suppurative	Malaria	Arthroscopy	.....	D.	
6	Orland Achard	1890	mo.	M	Shoulder	Pn. few days before	Suppurative	.....	Arthroscopy	.....	R.	
7	Orlman and Samter <sup>48</sup>	1890	34	M	Both elbows and rt. knee	Pn. 5 days after	Suppurative	Acute myositis.	.....	.....	D.	Secondary to throat.
8	Boulocheas	1891	5	M	Elbow and knee	Pn. crisis 2 days before	Suppurative	Acute nephritis.	O	.....	D.	
9	Chantemesse*	1891	A	..	Elbow and knee	Pn. 4 days before	Suppurative	Meningitis	?	.....	D.	
10	Macaire and Chippault <sup>1</sup>	1891	60	F	Rt. knee	Pn. 4 days before	Suppurative	.....	Arthroscopy	.....	R.	
11	Picque and Veillon <sup>108</sup>	1891	36	M	Rt. knee	Pn. 4 days before	Suppurative	.....	Arthroscopy	.....	D.	
12	Brunner <sup>11</sup>	1892	52	M	Left wrist	Pn. 2 days before	Suppurative	.....	Arthroscopy	.....	D.	
13	Juvigny <sup>46</sup>	1894	52	M	Both knees.	Pneumonia	Suppurative	.....	Aspiration, arthroscopy	.....	D.	
14	Meunier <sup>58</sup>	1894	60	M	Ankle	Pn. 4 days before	Suppurative	Septicæmia	.....	?	Left hospital against advice.	
15	Sittmann <sup>14</sup>	1894	40	M	Rt. shoulder	Pneumonia	Suppurative	Peri- and endocarditis	O	.....	D.	
16	Dominici <sup>29</sup>	1895	44	M	Rt. shoulder	Pn. 12 days before	Suppurative	Meningitis, lead poisoning.	Arthroscopy	.....	D.	
17	Kasperek <sup>47</sup>	1895	...	M	Left metatarsophalangeal	None	Suppurative	Peri- and endocarditis.	?	.....	D.	
18	Ausset <sup>4</sup>	1896	41	M	Both knees	Pn. 7 days before	Suppurative	Pericarditis, gout, chronic lead poisoning	?	.....	D.	Chronic lead poisoning; crystals of sodium urate in articular cartilage. Rheumatism two years previously.

\* Quoted from case. Original not found.

## PNEUMOCOCCIC ARTHRITIS.

18	Fernet and Lor- rain <sup>44</sup>	1896	56	M	L. sternoclau- dicular; rt. shoulder	?	Suppurative	Suppurative men- ingitis hemiple- gia, acute endo- carditis	Arthroscopy	?	D. Extreme destruction of joint.	
19	Griffont <sup>44</sup>	1896	71	F	Rt. ankle	?	Suppurative	Suppurative men- ingitis hemiple- gia, acute endo- carditis	Arthroscopy	?	Shoulder recovered before death	
20	Mercantoni <sup>44</sup>	1896	71	M	Rt. shoulder	Pn. few days before	Suppurative	Endocarditis. Bi- lateral empyema	O	.....	D.	
21	Nicolayenne <sup>44</sup>	1896	3 wk.	M	Rt. elbow	Pn. 8 days be- fore	Suppurative	Endocarditis. Bi- lateral empyema	?	.....	D.	
22	Schababu <sup>44</sup>	1896	45	M	L. knee and hip	Pneumonia	Suppurative	Lead poisoning, endo- carditis	Arthroscopy	.....	D.	
23	Vogelius <sup>44</sup>	1896	38	M	Rt. sternoclau- dicular	Pn. 5 days be- fore	Suppurative	Lead poisoning, endo- carditis	Arthroscopy	.....	R.	
24	Vogelius <sup>44</sup>	1896	60	M	Hip	Pn. some days before	Suppurative	Suppurative peri- ostitis; lead poi- soning; gout	O	.....	D.	
25	Widall <sup>44</sup>	1896	A	M	Metatarsal phalangeal	None	Suppurative	Suppurative peri- ostitis	Arthroscopy	.....	D. Crystals of sodium urate in joint.	
26	Widal and Mes- lay <sup>44</sup>	1896	A	M	Metatarsal phalangeal	None	Suppurative	Suppurative peri- ostitis	O	.....	D. Crystals of sodium urate in joint. Worker in lead.	
27	Dofq and Le- damanya <sup>44</sup>	1897	32	M	L. shoulder; both elbows	Pn. 9 days be- fore	Suppurative	.....	?	.....	D. Old rheumatoid arthritis.	
28	Heubner <sup>44</sup>	1897	5 mo.	..	L. shoulder	Pn. 4 weeks before	Suppurative	.....	Arthroscopy	.....	R.	
29	Lexier <sup>44</sup>	1897	5 mo.	..	Knee	None	Suppurative	.....	Arthroscopy	.....	R.	
30	Lexier <sup>44</sup>	1897	9 mo.	..	Shoulder	None	Suppurative	.....	Arthroscopy	.....	R.	
31		1897	9 yr.	..	Knee and hip	Pn. 9 weeks before	Suppurative	.....	Arthroscopy	.....	R.	
32	Muhsam <sup>44</sup>	1897	55	M	Rt. shoulder	Pn. 29 days before	Suppurative	.....	Arthroscopy	.....	R. Alcoholic joint disintegrated.	
33	Tourrier and Courmont <sup>44</sup>	1897	50	M	L. knee and shoulder	Pn. 6 days be- fore	Suppurative	Empyema. Sec- ondary syphilis	Arthroscopy	.....	D.	
34	Widal and Mer- ciere <sup>44</sup>	1897	46	M	Wrist and an- kle	Pn. 4 days be- fore	Suppurative	Endocarditis	?	.....	D. Typhoid arthritis 25 years before.	
35	Boix <sup>44</sup>	1898	A	M	Rt. knee	Pneumonia	Suppurative	General pyemia	Repeated as- pirations	.....	D.	
36	Flament <sup>44</sup>	1898	53	M	Rt. knee	Pollnow's pneumonia	Suppurative	.....	Repeated as- pirations	.....	R.	
37	Gagnon <sup>44</sup>	1898	8 mo.	F	Knee	None	Suppurative	Purulent conjunc- tivitis	Resection	.....	R.	
38	Galliard <sup>44</sup> and Morely <sup>44</sup>	1898	44	M	Rt. wrist	Pn. 9 days be- fore	Suppurative	.....	Arthroscopy	.....	R.	
39	Hagenbach and Burchard <sup>44</sup>	1898	2½	F	Shoulder and rt. knee	None	Suppurative	Abscess of arm; abscess of thigh.	Arthroscopy	.....	R.	

CHRONOLOGIC TABLE OF REPORTED CASES OF PNEUMOCOCCIC ARTHRITIS.—Continued.

No.	Reporter	Date	Age	Sex	Seat of arthritis	Relation of pneumonia	Nature	Complications	Treatment of joint	Functional result	Recovery or death	Remarks
40	McDonald <sup>18</sup>	1898	15	M	Hip	None	Suppurative	General sepsis	Arthroscopy	.....	D.	Suppurative joint following injury.
41	Osler <sup>19</sup>	1898	24	M	Knee	Pneumonia	Suppurative	Meningitis and double pneumo- nia; septicamia	Arthroscopy	.....	D.	
42	Petit <sup>20</sup>	1898	42	M	L. knee	Pn. 5 days before Pn. crisis	Suppurative	Meningitis	Arthroscopy	.....	D.	
43	Uckmar <sup>21</sup>	1898	A	M	Rt. shoulder	None	Suppurative	.....	Aspiration and arthro- scopy	Perfect	R.	Chronic rheumatic.
44	Widal and Les- ne <sup>22</sup>	1898	68	M	L. sternoclavicular	Pn. 9 days be- fore	Suppurative	Endocarditis; peri- meningitis; pleurisy;	Repaired as- pirations?	.....	R.	
45	Leroux <sup>23</sup>	1899	45	M	L. wrist	None	Suppurative	Suppurative men- ingitis; general pneumococcus, bacteremia	?	.....	D.	
46	Preble <sup>24</sup>	1899	43	F	Knee, ankle, wrist and elbows	Pneumonia	?	.....	?	.....	D.	
47	Preble <sup>25</sup>	1899	33	M	Knee, elbow, wrist, 2nd metacarpo- phalangeal	Pneumonia	?	.....	?	.....	D.	
48	Sorel <sup>26</sup>	1899	48	M	L. shoulder	Pn. 8 days be- fore	Suppurative	Empyema	?	.....	D.	
49	Billing <sup>27</sup>	1900	23	M	Rt. shoulder, left knee, metatarsal- phalangeal	Pneumonia	Suppurative	?	O	.....	D.	Injured left shoulder and knee one day before onset of arthritis. Old rheumatic.
50	Pernet and La- Caperas <sup>28</sup>	1900	47	M	Rt. wrist	Pn. 3 days be- fore	Serous	.....	Staff joint	R.		
51	Lop and Bonus <sup>29</sup>	1900	28	F	Rt. wrist	Pn. 8 days lat- er	Suppurative	Peritonitis; sup- purative parotitis	Arthroscopy	.....	R.	Followed labor and perito- nitis. Pneumococci in vaginal discharge.
52	Rendu <sup>30</sup>	1900	66	M	L. knee, l. ster- noclavicular	Pn. 15 days before	Serous and suppurative	Arthroscopy	.....	R.		

PNEUMOCOCCIC ARTHRITIS.

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53 Agathos <sup>2</sup>	1901	60	M	L. sternoclavicular	Pneumonia	Suppurative	Arthroscopy	R.
54 Agathos <sup>3</sup>	1901	63	M	L. wrist	Pn. 10 days before	Suppurative	Arthroscopy	R.
55 Allen and Lull <sup>4</sup>	1901	40	F	L. knee	None	Suppurative	Arthroscopy, amputation	Primary case.
56 Arzilotti <sup>4</sup>	1901	50	M	L. knee	Pneumonia	Suppurative	Arthroscopy	D.
57 Cavet <sup>5</sup>	1901	51	M	L. shoulder	Pn. 9 days before	Suppurative	Arthroscopy	D. Injury to shoulder.
58 Lannois and Paris <sup>6</sup>	1901	46	M	Rt. wrist	Followed pn.	?	Arthroscopy	R.
59 Rawill <sup>7</sup>	1901	28	M	Rt. sternoclavicular	Pn. 3 days before	Suppurative	Arthroscopy	D.
60 Rawill	1901	52	M	Rt. ankle	Pn. 2 days before	Suppurative	Arthroscopy	R. Old rheumatic.
61 Rawill	1901	49	F	Rt. shoulder	Pn. 2 days before	Suppurative	Arthroscopy	D. Alcoholic.
62 Rawill	1901	23	M	Rt. knee	Pn. 2 days before	Serous	Aspiration	Useful joint
63 Rawill	1901	51	M	Both knees	Pn. 6 days before	Serous	Aspiration	R. Alcoholic.
64 Rawill	1901	58	M	Rt. knee	Pn. 3 days before	Suppurative	Arthroscopy	D. Alcoholic.
65 Rawill	1901	42	M	Rt. shoulder	None	Suppurative	Arthroscopy	D. Alcoholic.
66 Barnards <sup>8</sup>	1902	14	M	Rt. knee	Broncho-pn.	Suppurative	O	D. Alcoholic.
67 Bichat and Goepert <sup>9</sup>	1902	8 mo.	F	Rt. knee	Broncho-pn.	Suppurative	Arthroscopy	Perfect R.
68 Bichat and Goepert <sup>10</sup>	1902	11	F	Rt. knee	Pn. 12 days before	Suppurative	Exploratory puncture	? Left hospital against advice.
69 Coles <sup>11</sup>	1902	50	M	Ankle	Pn. later	Suppurative	Aspiration, arthroscopy	R. Leucocytes 15,000.
70 Coles	1902	55	M	Both knees and ankles	Pneumonia	Suppurative	Senticemia and meningitis	D. Old arthritis deformans.
71 Gaillard <sup>12</sup>	1902	63	M	Rt. knee	Pneumonia	Suppurative	Aspiration, arthroscopy, amputation	D. Chronic alcoholic.
72 Giltay <sup>13</sup>	1902	31	M	Rt. knee	Pneumonia	Suppurative	Aspiration?	D. Chronic alcoholic.
73 Hektoen <sup>14</sup>	1902	47	M	L. knee	Pneumonia	Suppurative	Free motion	D. Alcoholic.
74 Herrick <sup>14</sup>	1902	32	M	L. elbow	Pn. 7 days before	Suppurative	Useful knee	R. Alcoholic. Injured knee one month previously.
75 Herrick <sup>14</sup>	1902	41	M	L. knee	Pn. 2 weeks before	Serous	Repeated aspirations	D.
76 Herrick <sup>14</sup>	1902	26	M	Rt. knee	Pn. crisis 8 days before	Suppurative	Arthroscopy	D.

CHRONOLOGIC TABLE OF REPORTED CASES OF PNEUMOCOCCIC ARTHRITIS.—Continued.

No.	Reporter	Date	Age	Sex	Seat of arthritis	Nature	Complications	Treatment of joint	Functional result	Remarks
77 78	Miller <sup>44</sup> Pfisterer <sup>44</sup>	1902 1902	A 8 mo.	M F	Rt. wrist Both wrists and left knee	Followed pn. Broncho-pn.	Serous Suppurative	Double otitis media, suppurative meningitis; nephritis	O ?	Stiff joint .....
79	Pfisterer <sup>44</sup>	1902	13	M	Hip	Pn. 10 days before Pn. 7 days	Suppurative	Arthroscopy	.....	R.
80	Quinello	1902	30	F	Rt. sternoclavicular Meta carpo-phalangeal L. elbow	Suppurative before Pneumonia	Endocarditis, nephritis Pericarditis	Arthroscopy ?	.....	D. Old rheumatism.
81	Siredey and Coudert <sup>13</sup>	1902	25	F	L. elbow	Pn. 10 days before	Suppurative	Aspirations	.....	D.
82	Spitta <sup>13</sup>	1902	17	..	..	Pn. 9 days before	Empyema, meningitis	Arthroscopy	.....	D.
83	Wells <sup>38</sup>	1902	32	F	L. sternoclavicular L. knee	Suppurative	Bronchitis	Arthroscopy	.....	R.
84	Dudgeon and Branson <sup>39</sup>	1903	5 mo.	F	M. L. knee, r. hip and wrist	None	Asthenia	Arthroscopy	.....	D.
85	Dudgeon and Branson <sup>39</sup>	1903	6	M	Knee, interphalangeal (hand)	Suppurative	.....	Arthroscopy	.....	D. Secondary to otitis media.
86	Dudgeon and Branson <sup>39</sup>	1903	6 mo.	..	Rt. elbow	Pn. 2 weeks before	Suppurative	Arthroscopy	.....	D.
87	Dudgeon and Branson <sup>39</sup>	1903	14	M	Rt. hip	None	Suppurative	Arthroscopy	.....	R. Secondary to measles.
88	Dudgeon and Branson <sup>39</sup>	1903	21	..	..	None	Suppurative	Dislocated joint	.....	R.
89	Finkelstein	1903	13	M	Hip	None	Suppurative	Aspirated	.....	D.
90	Howard <sup>41</sup>	1903	42	M	Rt. shoulder, rt. ankle	Pn. 7 days before	Suppurative	O	.....	D.
91	Howard <sup>41</sup>	1903	79	M	Both knees, l. shoulder	Pn. 7 days before	Suppurative	O	.....	D.
92	Howard <sup>41</sup>	1903	69	F	Knee	Pn. 10 days before	Suppurative	O	.....	D.
93	Meyer <sup>40</sup>	1903	21	M	L. ankle	None	Suppurative	Arthroscopy	.....	R. Secondary to varicella.

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94	Meyer <sup>40</sup>	1903	16	F	R. shoulder	None	Suppurative	Aspiration	.....	R.
95	Meyer <sup>40</sup>	1903	36	F	L. shoulder and l. hip	Pneumonia	Suppurative	Arthroscopy	.....	R.
96	Pacchioni <sup>40</sup>	1903	2½	F	Both hips, l. shoulder.	Pn. 3 weeks before pneumonia	? Pneumococcus vaginitis	Aspiration	.....	R.
97	Rawls	1903	41	F	L. tempor-o. maxillary	None	Suppurative	Arthroscopy	.....	R.
98	Salmon <sup>41</sup>	1903	2½	..	Large joints	Pn. 20 years before Rt. elbow	Suppurative	Arthroscopy	.....	D. Primary case.
99	Schuster <sup>42</sup>	1903	mo.	A	Rt. knee small joints of foot	Pn. 4 days before Wrist, ankle, knee, shoulder	Suppurative	Arthroscopy	.....	D. Pneumococcus in urine.
100	Simonini	1903	3 mo.	F	Rt. knee	None	Serous and suppurative	Aspiration, arthroscopy	Function limited	R. Pneumococcus in urine secondary to pharynx and tonsils.
101	Simonini	1903	9	F	Rt. knee	Pr. 6 days before Pn. 2 weeks before	Suppurative	Aspiration	Function perfect	R. Pneumococcus in urine.
102	Simonini <sup>43</sup>	1903	4½	F	Rt. wrist, elbow	None	Suppurative	Arthroscopy, amputation	Function perfect	R. Pneumococcus, infection of tuberculous joint.
103	Slaughter <sup>44</sup>	1903	15	M	Rt. knee	Pr. 1 week	Suppurative	Arthroscopy	.....	R. Primary case.
104	Tubby <sup>45</sup>	1903	14	M	Rt. knee	None	Suppurative	Arthroscopy	.....	R. Primary case.
105	Brunn <sup>46</sup>	1904	II	F	Rt. knee	None	Suppurative	Arthroscopy	.....	R. Primary case.
106	Brunn <sup>47</sup>	1904	16	F	Rt. knee	None	Suppurative	Arthroscopy	.....	R. Secondary to suppuration at umbilicus.
107	Cabanes <sup>48</sup>	1904	22 d.	M	L. ankle, knee and shoulder	None	Suppurative	Arthroscopy	.....	R. Secondary to otitis and coryza.
108	Ciechomak <sup>49</sup>	1904	5½	F	Rt. wrist and hip	None	Suppurative	Arthroscopy	.....	R. Secondary to otitis media.
109	Davis and Brown <sup>50</sup>	1904	8	F	Rt. knee	Pn. 1 day before	Suppurative	Ankylosis	.....	D. Secondary to otitis media.
110	Davis and Brown <sup>50</sup>	1904	13	F	Rt. sternoclavicular and wrist	None	Suppurative	Arthroscopy	Fair function	R.
111	Goldthwait <sup>51</sup>	1904	5	..	Shoulder	? Pn. 6 days before	Suppurative	Arthroscopy	.....	D.
112	Krokiwitz <sup>50</sup>	1904	28	M	Rt. foot, left shoulder	None	Suppurative	Arthroscopy	.....	R. Followed injury to joint from fall.
113	Segréa <sup>52</sup>	1904	18	M	Knee	None	Suppurative	Arthroscopy	.....	R. Old rheumatic fistula.
114	Segréa Cohen <sup>53</sup>	1904	51	M	Ankle	None	Suppurative	Arthroscopy	.....	R. Followed umbilical fistula.
115		1905	30	F						

CHRONOLOGIC TABLE OF REPORTED CASES OF PNEUMOCOCCIC ARTHRITIS.—Continued.

No.	Reporter	Date	Age	Sex	Seat of arthritis	Relation of pneumonia	Nature	Complications	Treatment of joint	Functional result	Remarks
											Recovery or death of patient
116	Ely <sup>43</sup>	1905	4	M	L. hip	Pn. 9 days before	Suppurative	Suppurative pleurisy	Aspiration, arthroscopy, Repeated aspirations O	.....	D. Leucocytes 24,400. Head of bone eroded.
117	Foranca <sup>44</sup>	1905	28	F	Rt. knee	None	Suppurative	.....	.....	.....	Probably secondary to throat infection.
118	Nattan-Larrier <sup>45</sup>	1905	Inf't	M	Rt. shoulder	None	Suppurative	.....	.....	.....	Followed operation for bare-lip. Pure pneumococcus culture from both joint and lip wound.
119	Rossi <sup>46</sup>	1905	30	M	Multiple	Pn. 4 days later	Serous	O	.....	.....	D.
120	Witt <sup>47</sup>	1905	36	M	Rt. knee	Pn. 17 days before	Suppurative	Aspirated	.....	.....	R.
121	Berghinz <sup>48</sup>	1906	11	..	L. sternoclavicular; rt. hip	Broncho-pn.	Suppurative	Suppurative pleurisy	.....	.....	D.
122	Chatterjee <sup>49</sup>	1906	28	M	Rt. knee	Pn. 6 days before	Suppurative	.....	Arthroscopy	Partial stiff joint	R.
123	Chatterjee <sup>49</sup>	1906	40	M	Rt. knee	Pn. 4 days before	Suppurative	.....	Aspiration	.....	?
124	Chatterjee <sup>49</sup>	1906	57	M	L. shoulder	Pneumonia	Suppurative	.....	Arthroscopy	Ankylosis	R. Necrosis of bone; leucocytes 125,000-150,000.
125	Ghedini <sup>50</sup>	1906	50	M	L. sternoclavicular	Pn. few days before	Suppurative	.....	Arthroscopy	.....	R.
126	Greathead <sup>51</sup>	1906	4	M	Rt. knee	After pn.	Suppurative	.....	Arthroscopy	.....	R.
127	Herzog <sup>52</sup>	1906	9	M	Wrists	None	Serous	Septicæmia	?	.....	D.
128	Herzog <sup>53</sup>	1906	5 mo.	F	Both shoulders; l. knee	Broncho-pn.	Suppurative	.....	Arthroscopy	.....	D.
129	Herzog <sup>54</sup>	1906	1	F	L. hip	Broncho-pn.	Suppurative	Rickets	Arthroscopy	Good function	R.
130	Herzog <sup>55</sup>	1906	8 mo.	F	Rt. hip	Pn. 3 weeks before ?	Suppurative	.....	Arthroscopy	Good function	R.
131	Howard <sup>56</sup>	1906	..	..	Rt. shoulder and l. ankle	Suppurative	Suppurative	Peri- and endocarditis	?	.....	D.
132	McGinnon <sup>57</sup>	1906	35	M	Rt. ankle	Pn. 7 days before	Suppurative	.....	Arthroscopy	Movable joint	R.

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133	Middletown*	1906	31	M	L. knee	Pn. 7 days before	Suppurative	Aspirated	Aspiration	Good function	R.	D.								
134	Pasteur and Courtaldu Pitts	1906	23	M	Rt. knee	None	Suppurative	?	arthroscopy?	.....	.....									
135	Von Kautzias	1906	17	M	Multiple	Pn. crisis 1 day before	?	General bacteremia severe	Arthroscopy	.....	.....	D.								
136	Rawis	1906	40	M	Rt. knee	Pn. 5 days before	Suppurative	Arthroscopy	.....	.....	.....	D.								
137	Secretan and Wrangham**	1906	16	M	Rt. knee	Pn. 2 weeks before	Suppurative	Arthroscopy	Perf ect function	.....	.....	D.								
138	Bassenge?	1907	56	M	Knee	None	Suppurative	Aspiration	.....	.....	.....	D.								
139	Carmichael*	1907	6 wk.	F	Hip and wrist	Pneumonia	Suppurative	Arthroscopy	.....	.....	.....	R.								
140	Coutts?	1907	2	F	Rt. shoulder and l. hip	Pn. 6 months later	Suppurative	Arthroscopy	.....	.....	.....	D.								
141	Purrier†	1907	16	M	Rt. elbow	None	Suppurative	Arthroscopy	.....	.....	.....	D.								
142	Nitch††	1907	1	F	L. knee	None	Suppurative	Otitis media, bronchitis	Aspiration, arthroscopy	Perfect function	R.									
143	Nitch††	1907	6 mo.	F	Rt. knee	None	Suppurative	Otitis media	Aspiration	.....	.....	D.								
144	Pendle Von Kautzias	1907	70	F	L. knee	Pneumonia	Serous	Arthroscopy	Arthroscopy	Good function	R.									
145	Von Kautzias	1907	52	F	Rt. knee	Pn. 14 days before	Suppurative	Aspiration	Arthroscopy	Good function	R.									
146	Von Kautzias	1907	2	M	Rt. knee	Pneumonia	Suppurative	Rickets	Arthroscopy	Good function	R.									
147	Bell	1908	22	M	Rt. sternoclavicular Hip	Pn. 15 days before	Suppurative	General bacteremia	Arthroscopy	Good function	R.									
148	Eyre‡‡	1908	C	F	Both ankles, 1. knee L. shoulder	None	Suppurative	Abscesses of arm, empyema	Arthroscopy	Good function	R.									
149	Gasne§	1908	4	M	Rt. knee	Pn. 14 days before	Suppurative	Rickets	M u l t i p l e arthroscopy	Good function	R.									
150	Gasne§	1908	3	F	Rt. knee	None	Suppurative	Pneumococcus peritonitis and meningitis	Arthroscopy	Good function	R.									
151	Gasne§	1908	1	F	Rt. knee	None	Suppurative	Rickets	Aspiration	Good function	R.									
152	Gasne§	1908	25 d.	M	L. knee	Pn. 14 days before	Suppurative	Rickets	Arthroscopy	Good function	R.									
153	Hand and Johnson†	1908	46	M	Knee	After pn.	Suppurative	Aspiration	Arthroscopy	Perfect function	R.									
154	Holt	1908	Inf't	F	Shoulder	?	Suppurative	Aspiration	Arthroscopy	.....	.....	R.								
155	Kirmissen*	1908	4	M	Rt. shoulder	?	Suppurative	Rickets	Aspiration	.....	.....	R.								
156	Kirmissen*	1908	14	M	Rt. knee	?	Suppurative	Rickets	Arthroscopy	.....	.....	R.								

CHRONOLOGIC TABLE OF REPORTED CASES OF PNEUMOCOCCIC ARTHRITIS.—Continued.

No.	Reporter	Date	Age	Sex	Seat of arthritis	Relation of pneumonia	Nature	Complications	Treatment of joint	Functional result	Recovery or death	Remarks
157	Low <sup>4</sup>	1908	A	M	Multiple	None	Serous	Pneumococcus cystitis	Autogenous vaccine	Good function.	R.	Secondary to pneumococcus cystitis.
158	Matthews <sup>5</sup>	1908	34	M	Rt. shoulder	Pn. 9 days before	Suppurative	Acute endocarditis	Arthroscopy	.....	D.	
159	LaFetra <sup>6</sup>	1909	8 mo.	F	Knee	Pn. 7 weeks before	Suppurative	Meningitis	Arthroscopy	.....	D.	
160	Leulle and Leconte <sup>7</sup>	1909	41	M	L. ankle	Pneumonia	Suppurative		Arthroscopy	.....	R.	Very alcoholic.
161	Strickler <sup>8</sup>	1909	25	F	Knee	?	Serous	Suppurative thyroiditis; multiple abscesses	Aspiration	Partial still joint	R.	
162	Adenot <sup>9</sup>	1910	41	M	Rt. knee	Pn. 14 days before	Suppurative		Aspiration	Fairly useful joint	R.	Old syphilis.
163	Jaboulay <sup>10</sup>	1910	A	M	Elbow	Pneumonia	Suppurative		?	?	?	Secondary to trauma
164	Kopile <sup>11</sup>	1910	Infrt.	F	Rt. elbow	Broncho-pn. 7 days before	?		?	0	.....	Congenital syphilis.
165	Leclerc and Favre <sup>12</sup>	1910	32	F	L. shoulder	Pn. 11 days before	Suppurative			0	.....	D.
166	MacCordick <sup>13</sup>	1910	16	F	L. shoulder	None	Suppurative			0	.....	Old rheumatism.
167	MacCordick <sup>14</sup>	1910	16	F	L. ankle	Pn. few days after	Serous	Pericarditis, endocarditis, pericarditis, pleurisy, endocarditis, pleurisy	0	.....	D.	Old rheumatic.
168	MacCordick <sup>15</sup>	1910	13	F	L. shoulder	Pn. 6 days before	Serous	Endocarditis	Aspiration	0	.....	Previous rheumatism.
169	MacCordick <sup>16</sup>	1910	14	F	Both knees	None	Suppurative			0	.....	D.
170	Trevisanollo <sup>17</sup>	1911	A	M	Left knee	Pn. 9 days before	Serous	Abscess of gluteal region	Arthroscopy	Joint deformity	R.	Secondary to gastro-enteritis.
171	Eberg <sup>18</sup>	1913	3 wk.	F	Rt. hip	None	Suppurative		Arthroscopy	.....	R.	Secondary to ileocolitis.
172	Eberg <sup>19</sup>	1913	2 mo.	F	Both hips	None	Suppurative		Aspiration, arthroscopy	Perfect function	R.	
173	Bulkley	1913	II	F	Rt. shoulder	Pn. 2 weeks before	Suppurative					

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## THE USE OF CITRATE SOLUTIONS IN THE PREVENTION OF PERITONEAL ADHESIONS.\*

BY SAXTON POPE, M.D.,

OF SAN FRANCISCO, CAL.,

Instructor in Surgery in the University of California.

A BETTER title for this paper would be: An experimental study in the prevention of peritoneal adhesions, working upon the hypothesis that fibrous exudates in the peritoneal cavity depend upon the same principles that apply to the formation of fibrin in blood clots; *i.e.*, before a fibrous exudate can form in the peritoneal cavity with its resultant plastic agglutination, there must be the liberation of that hypothetical ferment, thrombokinase, its activation of prothrombin in the presence of calcium and the production of thrombin.

Thrombin as an active enzyme converts soluble fibrinogen into fibrin.

If then, we are to attempt to influence the production of fibrin deposits or peritoneal adhesions in the abdominal cavity, we must by some method inhibit the process of ferment activity. We must either inactivate thrombokinase or bind the calcium in the serous exudate.

In the Research Laboratory of the Medical Department of the University of California I have done a series of some sixty experiments on rabbits (these animals have all been under ether narcosis).

To determine first, whether or not there was an active thrombin element in the normal peritoneum, a rabbit was carefully opened, the peritoneum gently everted, covering the edges of the abdominal incision. An artery in the flank was cut and allowed to bleed freely into the abdominal cavity. Clotting occurred at the site of bleeding in 5 minutes, which is about the normal time for rabbits. Blood, running over the surface of this clot and gravitating to the region about the kidney where neither air had entered nor any trauma had been inflicted, remained fluid and unclotted for 15 minutes.

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\* Read before the California Academy of Medicine, May 26, 1913.

Rabbit No. 2 was similarly opened, the peritoneum roughly scrubbed with a gauze sponge, a mesenteric vessel cut and allowed to bleed. Clotting occurred in 3 minutes.

Rabbit No. 3 was opened, the contents of the ileum and jejunum smeared over the intestines and an artery in the mesentery severed. Blood flowing outside the peritoneal cavity clotted in four minutes, while blood in the soiled peritoneum was mainly fluid at the end of 15 minutes.

These findings are paralleled by clinical experience. It is a common phenomenon to observe that during abdominal operations, where the peritoneum is abraded and traumatized extensively, there is an abundant formation of clots. While after intra-abdominal wounds which cause little trauma, but sever large blood-vessels, the abdomen may be found filled with fluid blood. It is also no uncommon thing to find laked, unclotted blood where the intestinal or gastric contents have escaped into the abdominal cavity following perforating or lacerating wounds of these viscera.

From this evidence we may assume first of all that there is not an active thrombin element in the normal, untraumatized peritoneal cavity. Second, that trauma to the endothelium of the peritoneum, even exposure to the air, causes the liberation of an active thrombin ferment, supposedly thrombokinase. Third, that the presence of intestinal or gastric juice with its ferments retards or abolishes the action of thrombokinase.

It is, of course, a fact that pepsin, trypsin and other powerful enzymes will inactivate thrombokinase. It is also a physiologic law that thrombokinase only is active in the presence of a calcium salt. And this salt may be bound or neutralized by citrates, oxalates or sulphates.

These experiments have been conducted to ascertain if this hypothesis in any way helped to elucidate the problem of peritoneal exudates, and the production or prevention of peritoneal adhesions. Heretofore, apparently all our preventive measures have assumed the rôle of lubricants or protectives, as if the abdominal organs were a collection of lead pipes, pistons, filters and valves,—a purely mechanical conception.

In this work, therefore, the direct experimental method,

the empirical testing of measures only vaguely suggestive, and the control, or comparative measures, have been combined. Because our interest is mainly centred in that phase of peritoneal adhesions found in the surgical problems of the abdomen, I have applied my endeavors to the prevention, if possible, of post-operative adhesions.

To mimic those conditions which most surely are productive of strong fibrous adhesions, the colon of the rabbit was scarified throughout its length with multiple scratches about an inch long, possibly four or five hundred in number. These were deep enough to cause oozing of blood, to expose the muscularis, but avoided active bleeding and puncture.

In control rabbits at the end of a week an abdomen thus treated is a mass of agglutinated intestine, hemorrhagic exudate, fibrous lymph and many plastic adhesions. In order to tabulate the results of these various experiments two general headings have been made, designated as exudate and adhesions, and their degree marked by the plus or minus sign. In some instances a quantitative estimation of the albumin output was made and recorded. This was done by implanting little glass tubes in the abdominal cavity and at the end of a week estimating by means of phosphotungstic acid, the albumin content. It was hoped by this device to be able to gauge the relative inflammatory reaction present. But the method was found too uncertain to warrant putting any confidence in it.

The following tabulation shows the average result of repeated experiments. The variations in these repetitions were so small that no indecision arose over the markings. In each case the scarification of the colon was followed by pouring into the abdominal cavity one-half ounce of the sterilized solution in question. The incisions were closed with silk.

In this series of exudates none presented a worse appearance than the experiment with camphorated oil. Here there is a thick creamy deposit, masses of fibrous lymph, large placques of camphor adherent to the mural peritoneum and under the diaphragm, and dense resistant adhesions throughout the entire abdomen.

TABLE I.

	Exudate.	Adhesions.
Control .....	+	++
Tr. Iodine .....	++	++
Camphorated oil .....	+++	+++
Olive oil .....	++	++
Petrolatum .....	++	++
Butter .....	++	++
Sugar 50 per cent. solution .....	+	++
Citrated sugar .....	+	+
Egg albumen .....	+	+
Citrated egg albumen .....	++	+
Milk .....	+	+
Peptonized milk .....	+	-
Ringer's solution .....	-	++
Salt solution, normal .....	-	+
Ammonium oxalate 1 per cent. }	-	+
Salt solution. }	-	-
Citrate of soda 1 per cent. }	-	-
Salt solution. }	-	-
Sodium citrate 2 per cent. }	-	- -
Sodium chloride 4 per cent. } in water .....	-	- -
Citrate of soda solution 2 per cent. }	-	- -
Salt solution 3 per cent. }	-	- -

Petrolatum gives a slimy, greasy emulsion appearance, with quantities of opaque lymph and isolated firm adhesions between the intestines. The abdominal incision is poorly healed, its edges are insecurely agglutinated and appear poorly vascularized.

The only death occurring in this series of experiments resulted from the use of iodine in the abdomen. Apparently it was due to the toxic effect of iodine plus a septic peritonitis.

As you see from the table, citrate of soda in salt solution gives the best results. After an impartial scarification, which under normal circumstances at the end of a week would give a nasty peritoneum, with the addition of citrate solutions we have an abdomen practically free from exudate, no adhesions, sometimes the endothelium shows no sign of insult past a hazy opacity and thickening.

These findings are so striking in contrast to all others that they seemed incredible. If it were possible to show by

photographs this difference, the case would be clearly proved; but we must content ourselves with description.

It was apparent from the first that the citrate of soda—2 per cent.—with hypertonic salt solution—3 per cent.—was the best medium used. It was found that hypertonic solutions remained longer in the abdomen than normal solutions. A hypertonic solution colored with methylene blue gave traces of its presence after 48 hours, while normal solutions disappeared in half this time.

At the beginning of this *arbeit* the following questions arose:

First, are we not trying to prevent a natural protective process?

Second, will not capillary hemorrhage be encouraged?

Third, will not infection result, from an interference with the local immunity?

Fourth, will not these solutions be absorbed so rapidly that no good will result from their use?

Fifth, may these solutions themselves be toxic?

The first is the most difficult to answer. But we may change the question by asserting that Nature does not always work best alone and we are assisting rather than interfering.

To answer the second, two experiments were tried in which citrate solutions were employed after voluntarily severing many small vessels of the intestinal subserosa. No evidence of hemorrhage was found at autopsy one week later.

For the third question it must be said that rabbits are very resistant to abdominal infection and that we lost but one animal in the entire course of some 60 laparotomies, even in the face of rather indifferent asepsis.

The fourth question is answered by our success. In peritoneal post-operative inflammation, the height of the storm is past in 48 hours. The solution is present when most needed. When the insulted, traumatized endothelium is pouring out plastic exudate, with a large content of fibrin ferment, it is met by the inhibitory action of citrate of soda.

To test the toxicity of citrates and oxalates five grains each

in one-half ounce of salt solution were injected intravenously in two rabbits. It had no apparent effect on these animals.

It is conceded that probably the best medium for carrying the citrate solution has not been found, and that I have not taken into account the problem of colloids. It is quite likely that further investigation with these questions in view will throw much light upon the subject. Another feature of the work is that upon the introduction into the abdomen of these hypertonic salt solutions with or without citrates, there is always a marked peristalsis with an accompanying contraction of the abdominal muscles, which often rouses the animal from anæsthesia, and seemingly is painful. This quickly passes, and there is no evidence of local irritation—in fact, reddened and ecchymosed intestines become less vascular and more normal in color.

It is not assumed that citrate solutions will prevent adhesions where large denuded areas of the peritoneum are exposed. These should be treated by omental grafts or mesenteric plication. These laboratory results seem applicable only as a mild preventive measure during abdominal operations, which ordinarily tend to leave more or less agglutination and troublesome post-operative adhesions.

It is *not* suggested that large quantities of solution be left in the abdominal cavity, although in the absence of pus it probably is not detrimental so to do, but that the usual operating room solutions of normal salt have added to them a one or two per cent. of citrate of soda.

For the past month, Dr. Terry has employed a 3 per cent. salt with a 2 per cent. citrate solution in all abdominal work done at the University Hospital. It is not easy, of course, to determine how much good this does as a preventive, but from all visible signs in the laboratory, it certainly seems not only theoretically correct and far superior to any means hitherto employed, but is unquestionably of marked practical advantage.

## INCIDENCE OF GALL-STONES AND OTHER CALCULI AMONG LABORERS IN THE PANAMA CANAL ZONE.\*

BY H. C. CLARK, M.D.,

OF ANCON, CANAL ZONE.

(From the Board of Health Laboratories.)

THE labor force employed by the Isthmian Canal Commission is chiefly drawn from the negro population of the West Indies, therefore abundant opportunity is offered at Ancon Hospital for an anatomical study of young male negroes. Findings not infrequently occur here which are so at variance with the old ideas in regard to the influence of race, sex, age, and climate, that it is interesting to group certain factors for comparison and study.

A supposed immunity has always been granted the negro in respect to gall-stones. Keen<sup>1</sup> writes as follows: "I formerly thought gall-stones occurred in full-blooded negroes with extreme rarity. During fifteen years of practice in Louisville, Ky., I never saw a case in the colored race."

After ten years' experience in five of Philadelphia's hospitals, he later claims to have seen only one case. His correspondence with other surgeons, many of them in Southern States, led to almost the same findings. Pennsylvania Hospital, located in a portion of the city of Philadelphia near a large settlement of negroes, was able to report to him a few cases.

The negro apparently enjoys the same reputation with reference to urinary calculi, but is admitted to be less immune to vesical calculi, although the latter is reported by one authority to occur once in 55,305 blacks.

Osler<sup>2</sup> states that biliary calculi probably occur in from five to ten per cent. of all autopsies in the temperate zone, being uncommon in the tropics. Hektoen and Riesman<sup>3</sup> claim

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that biliary calculi, after the sixteenth year, are found in 25 per cent. of all bodies. Naunyn, in more than 9000 autopsies, finds that one case in every thirty had calculi.

All authorities seem to agree that the primitive races are possessed of a high degree of immunity from calculous formations.

Having recently completed a series of 1500 consecutive post-mortem examinations at Ancon Hospital, a review was made to determine the frequency of calculi of various types. Thirty-nine instances of biliary calculi were found, and classified with reference to race as follows:

Race.	Autopsies.	Biliary Calculi.	Per cent.
West Indian negro.....	1088	24	2.2+
Spanish—Indian (mixture).....	230	9	3.9+
Spain (white).....	108	3	2.7+
U. S. A. (white).....	25	1	
Italy (white).....	17	0	
Greece (white).....	7	0	
China (white).....	6	0	
England (white).....	5	0	
Germany (white).....	3	0	
France (white).....	3	1	
Unknown.....	8	0	

In classifying according to age and sex, the Ancon Hospital series will be compared with the Pennsylvania Hospital (Philadelphia) series reported to Dr. Keen by Dr. W. T. Longcope:

	Autopsies Pennsyl- vania Hospital.	Autopsies Ancon Hospital.	Pennsylvania Hospital.	Ancon Hospital.
Under 30 years of age.....	1	11	Males 15	Males 28
From 30 to 40.....	5	12	Females 16	Females 11
From 41 to 50.....	14	8		
From 51 to 60.....	6	3		
From 61 to 70.....	4	4		
Over 70.....	1	1		
Total.....	31	39	31	39

Pennsylvania Hospital: Number of autopsies in series, 1050.

Ancon Hospital: Number of autopsies in series, 1500.

This shows for the Pennsylvania Hospital a percentage of 2.95 + and for Ancon Hospital 2.6. No race entry was given in the Pennsylvania Hospital report, but a personal acquaint-

ance with that institution enables me to state that they deal principally with the white race.

No safe deductions can be made from a comparison of the age grouping in these two lists, for as has already been stated the Ancon series contains chiefly young male negroes. It is interesting to note, however, the number that has been found in the earlier decades of life. Considering the small number of females autopsied at Ancon Hospital it would appear that the females of the tropics would bear out the old idea of the prevalence of biliary calculi in their sex. Naunyn's theory that gall-stones are the result of a pathological alteration in the mucous membrane of the gall-bladder usually excited by the presence of bacteria, and leading to an increased deposition of lime and cholesterol, has met with general acceptance. Many instances are recorded which show that local infection is the chief factor in bringing about biliary lithiasis. If this is the case, then the negro of the tropics is thrown open to more etiological factors because he is often subjected to various forms of enteritis and colitis, which frequently run a chronic course. He is also exposed to the influence of such diseases as malarial haemoglobinuria in which pathological conditions in the biliary passages have been noted. Thus several additional factors may be at work in the tropics that are not encountered in the temperate zones.

An effort has been made to group the causes of death in the cases revealing gall-stones and also to group the evidences, past or present, of chronic infections which might throw light on the etiology. The causes of death in the 39 cases are as follows:

Lobar pneumonia,	7	Mental diseases,	2
Pyæmia,	4	Dysentery,	1
Intestinal obstruction,	3	Hæmoglobinuric fever,	1
Chronic nephritis,	3	Gastric and duodenal ulcers,	1
Tuberculosis,	3	Apoplexy,	1
Traumatism,	3	Aneurism,	1
Purulent infection of genito- urinary system,	2	Senility,	1
Cardiac diseases,	2	Anæmia,	1
Meningitis,	2	Diabetes mellitus,	1

Classification of other findings, occurring singly or in some combination, which may represent the origin of the influences predisposing to gall-stone formation:

Chronic adhesive perihepatitis and perisplenitis .....	14 times
Pelvic diseases of chronic inflammatory nature .....	5 times
Chronic fibrous peritonitis, general .....	5 times
Chronic ulcerative colitis .....	5 times
Chronic ulcers or cicatrices in duodenum and stomach .....	4 times
Chronic ulcers and cicatrices in ileum and caecum .....	1 time
Hernia, inguinal .....	2 times
Fibromyomata uteri (large masses) .....	3 times
Multiple pregnancy .....	1 time
Pancreatic disease .....	1 time
Cases with negative histories and no old lesions .....	8 times

In none of these cases would it seem likely that gall-stones had played a part in the cause of death unless it be that the pancreatic disease present in the case of diabetes mellitus was a sequel to the cholelithiasis.

To the list of predisposing factors may be added the note that in most all of the cases malarial pigment was present in spleen, liver, and marrow. In malarial haemoglobinuria marked inspissation of the bile occurs. It is not unlikely that such an influence or condition may be an etiological factor in the causation of gall-stone in the tropics.

In the series of 1500 autopsies, scars or ulcers were found in the stomach 31 times and in the duodenum 25 times. Reference to the tables given will show that ulcers of the duodenum and stomach had been a cause of death in one instance where gall-stones had been found, and in the table of predisposing factors one sees the entry of ulcers and cicatrices four times, and of intestinal lesions eight times. Peritoneal infections, ascending intestinal or local intestinal infections would appear to be very important factors. Large masses of myofibromata and pregnancy in a mechanical way might produce stagnation of the bile.

It is difficult to draw conclusions as to the incidence of gall-stones in the tropics, but it is evident that the Ancon Hospital series offers proof that the black man from the West Indies furnishes a greater percentage of cases of biliary

calculi than does his brother of the temperate zone. The clinical records at Ancon Hospital lend further proof of this, for not infrequently cholelithiasis has been the indication for surgical intervention. The attention being paid to the coincidence of gall-stones with other surgical diseases is well shown by a recent review of the laparotomies done in the service of each of three American surgeons. Dr. J. G. Clark<sup>4</sup> finds 27 instances of gall-stones associated with myoma uteri; 56 instances with other abdominal conditions chiefly of a pelvic nature. Dr. C. H. Mayo<sup>5</sup> records 1244 operations for myoma uteri in which there were 90 cases of coincident cholelithiasis. Dr. Philemon Truesdale<sup>6</sup> reports 500 laparotomies for pelvic conditions with 34 instances of associated gall-stones.

It would appear from this that Dr. Osler's statement in regard to biliary calculi as probably occurring in from 5 to 10 per cent. of all autopsies in the temperate zone would indicate the general prevalence. Since the analysis of the Ancon series another case of special interest has fallen into my hands which seems to deserve a brief note.

Case 139,790 was a black, male child of four months, which died of acute enterocolitis and as a contributing factor possessed a congenital cardiac defect, a patent foramen ovale, with hypertrophy of the right side of the heart. Cholelithiasis was a coincident factor. The gall-bladder was under some tension from its content of clear watery fluid. When this escaped two gall-stones were found. Each was about twice the size of a wheat grain and black in color. One was loosely engaged in the cystic duct at its entrance and the other free in the gall-bladder. The ducts were patent.

The combined weight of the two stones was 0.0295 grammes. They were subjected to a chemical examination by Mr. J. E. Jacob. The results, in brief, indicated a formation due to biliary pigments and some calcium oxalate. Cholesterin was absent.

Osler states that cholelithiasis is rarely encountered in infancy and childhood and that when it does occur it is doubtless due to intra-uterine infection. Maternal history in this instance was of no aid but the anatomical findings would in-

dicate an ascending intestinal infection as the etiological factor were it not for the extreme youth. It, at least, raises the question of the time required for such formations to occur.

Attention is directed to the disproportionate incidence of gall-stones among the cases of pyæmia and of intestinal obstruction.

Pyæmia (4 cases) and intestinal obstruction (3 cases) occupy an unusually conspicuous place as a cause of death in this series without being directly related to the gall-stone condition.

It seems possible that the causes favoring gall-stone would favor pyæmia, and on the other hand the cause favoring intestinal obstruction by favoring infection would further the processes leading to gall-stones.

The association of hernia might also be classed as an etiological factor because even moderate occasional constriction of the bowel favors the entrance of intestinal bacteria into the blood stream.

LITHIASIS OF THE URINARY PASSAGES.  
Tabulated Cases.

Race.	Age.	Sex.	Location of Calculus.
West Indian, negro...	47 years	Male	Three or four calculi in each kidney.
West Indian, negro...	21 years	Male	Right kidney.
West Indian, negro...	70 years	Male	Vesical calculus (prostatic disease).
West Indian, negro...	68 years	Male	1 small stone—pyramids calcified.
West Indian, negro...	4 days	Male	Calcification of the pyramids.
West Indian, negro...	11 days	Male	Calcification of the pyramids.
U. S. A., negro.....	43 years	Male	Bilateral ureteral calculi.
Spanish, Indian.....	87 years	Male	Vesical calculus (prostatic disease).

In these instances urinary lithiasis was only found in the male sex.

The number of negroes and individuals of Spanish-Indian mixture in this series of 1500 is 1318, the cases revealing some type of urinary lithiasis being eight. The clinical records at Ancon Hospital show a corresponding dearth in the negro.

In the two black male babies the condition manifested itself in the form of a "sand deposit" in the pelvis of each kidney and in the pyramids. It was so marked that the condition

seemed worthy of special mention. This has been frequently noted, though, to a less degree in babies and very old people, and also in certain cases of chronic nephritis. Holt,<sup>7</sup> basing his statement on 1000 autopsies on infants, states that granular deposits are generally seen in both kidneys, the pyramids not infrequently are calcified and rarely a calculus found.

In the two cases of vesical calculus extreme age and prostatic disease were present. In both instances a large soft stone was found.

The most interesting case of the series is the one tabulated as bilateral ureteral calculi. This was in a male negro laborer, forty-three years of age, from Virginia, who had lived for the past five years in a suburban division of Panama City. In each ureter a calculus was found at autopsy (A-3195) lodged just above the brim of the pelvis. The anatomical findings were chiefly cardiovascular and renal, with hydronephrosis superimposed. Syphilitic aortitis and small gummata in the liver were also found. In the left ureter there was found at the pelvic brim a calculus measuring 7 mm. in diameter and about 2 cm. long. In the right ureter at a similar point was another calculus 7 mm. by 1 cm.

The dried ureteral calculi were given to Mr. J. E. Jacob for chemical analysis. His report is appended: "The two calculi weighed approximately 0.6 grammes each. The cross-section of the calculi showed alternate layers of yellowish and yellowish-red material. They were found to be composed principally of uric acid with a small amount of ammonium urate. A trace of albuminous matter and ether soluble substance was also present."

Albarran<sup>8</sup> regards the presence of stone on both sides as an argument in favor of the systemic origin of renal calculi, the fact that they are not always found on both sides being due to the absence on one side of a nucleus upon which to deposit crystals, or to the calculus being voided before reaching considerable size, and in some instances to the ureter dilating and allowing even a large stone to pass into the bladder. The skiagraph in many instances reveals bilateral calculi, thus bearing out his view.

Lusk,<sup>9</sup> Mendel,<sup>10</sup> and others in their study of the formation and elimination of uric acid lend supporting evidence to the systemic origin of calculi.

*Pancreatic Calculi.*—This type occurred twice in the series. Once in a male negro of 21 years associated with biliary calculi in the cystic duct and extensive acute and chronic pancreatitis, diabetes mellitus being a sequel. Two long cylindrical calculi were found lying end to end in the dilated ducts about the middle of the pancreatic body.

The second occurrence was in a male negro of 44 years. Here a most extensive chronic interstitial pancreatitis was found with focal areas of acute pancreatitis wherever large tufts of tissue remained. No glycosuria was associated. The concretions were found throughout the organ in the form of shot-like collections of sand. Two cases of pancreatic calculi have been reported in a series of 1500 autopsies at Johns Hopkins Hospital. They are said to be infrequently met with, though I can find no other records at hand which would give an idea of the incidence of these calculi.

*Salivary Calculi.*—None appeared in the autopsy series but one instance was found in the surgical service of Dr. A. B. Herrick and is sufficiently rare to merit recording. A bullet-like calculus was found in the submaxillary gland removed from a male Barbadian negro of twenty-eight years. A ranula had formed and a superimposed acute and chronic inflammatory process was found. Mr. J. E. Jacob's report on the calculus was as follows: weight 0.4320 grammes; composition chiefly calcium and ammonium phosphates; traces of sodium, iron, phosphoric acid, and albuminous matter also present.

These concretions are said to occur five times more frequently in the submaxillary than in any of the other salivary glands.

*Concretions of the Tonsil.*—Infrequently the tonsillar crypts have contained irregular concretions probably resulting from diseases which have closed the exit of the crypts and allowed a calcareous degeneration to follow. These have sometimes had a diameter of from 4 mm. to 8 mm.

*Appendiceal Concretions.*—The occasional foreign body in the centre of concretions found elsewhere has to a certain extent been noted at Ancon. The only noteworthy exceptions that have attracted attention were two cases: one in which the dead body of an uncinaria or tricocephalus worm formed the nucleus and a second instance where several ova of *Trichuris trichiura* occupied the centre of a dried concretion.

SUMMARY.—(1) The findings at this hospital indicate a much less frequent occurrence of biliary calculi in the negro than in the white race living in the temperate zone, but they tend also to show a much greater incidence in the negro of the tropics than in his brother of the temperate zone.

(2) Suggestive factors relative to etiology are the prevalence of enteritis, colitis, and malaria, especially the intestinal diseases.

(3) Ancon Hospital findings would also indicate a higher percentage of cholelithiasis among the Old World Spaniards than authorities are willing to grant.

(4) Calculi of the urinary passages in the negro would appear to be extremely rare.

(5) One case lends argument in favor of the systemic origin of renal calculi.

(6) Intestinal nematodes may directly be the etiological factor in certain cases of appendicitis associated with fecal concretions by producing a portal of entry for infection in the mucosa of the appendix; or indirectly by furnishing the nucleus for a concretion and its frequent sequel, appendicitis.

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## **INTERSCAPULOTHORACIC AMPUTATION OF THE SHOULDER WITH COMPLETE EXCISION OF THE CLAVICLE.**

A REPORT OF THREE CASES.

**BY A. E. ROCKEY, M.D.,**  
**OF PORTLAND, OREGON.**

EXCISION of the entire clavicle may be advisable in interscapulothoracic amputation of the shoulder: (*a*) when the outer end of the bone is involved by malignant disease; (*b*) when the contiguous parts are so closely involved as to make the immunity of the clavicle uncertain, or (*c*) when the integument requires such extensive excision that the covering of the clavicular stump would make undue tension.

The cutaneous incision must be varied according to the location of the disease. The typical incision begins over the inner end of the clavicle, and extends outward around the base of the neck and backward above the upper border of the scapula. From both ends of this incision curved incisions with the convexity outward are carried down to a point in the axillary line opposite the lower angle of the scapula. The incision over the clavicle is carried firmly down to the bone, freely exposing the inner half but continuing it around the neck, and making also the anterior incision. The inner end of the clavicle may then be detached by severing the muscles and articular ligaments very close to the bone, being, of course, exceedingly careful not to wound the pleura or subclavicular vessels. As soon as the upper surface of the sternoclavicular articulation is opened, the assistant draws the clavicle forward and the posterior part of the articulation may be safely severed by short snips, with a pair of heavy blunt-pointed scissors. When this is loosened the clavicle is readily drawn down and out, and further detached until the vessels are well exposed. They are then ligated by passing the ligature with an aneurism

needle, being careful not to tear the thin-walled vein by rough handling. Linen or silk ligatures should be used. After the division of the vessels the brachial plexus is raised and severed with a sharp knife. I have not in any instance cocainized either these nerves or the sciatic before severing them in amputations, and have not seen any evidence of shock from this part of the operation. After the severing of the vessels and nerves the pectoralis muscles are cut close to their origin. The shoulder may then be readily turned back, raising the scapula from the chest wall and giving ready access to its attachments and vascular supply from the front. When this is done the operation is completed by making the posterior flap and the subcutaneous separation of the scapula.

Done in this way but little blood should be lost, and the operation is completed with facility, and with so little attendant shock that in all of the three cases here reported the patients were able to sit up in bed on the morning following the operation, and were permitted to walk about in a few days.

CASE I.—Lad of twelve years. During the absence of the family physician on a vacation, a swelling just above the middle of the left arm was noticed. It was slightly painful, and a neighbor, who was consulted, diagnosed it as rheumatism and prescribed osteopathic treatment. The plan was adopted and the lump received daily rubbing for several weeks, until the family physician returned. In the meantime it had greatly increased in size. On examination he found that spontaneous fracture had already taken place, made a diagnosis of sarcoma, and sent him to me for operation. A trans-scapular amputation was done, removing all of the shoulder-joint, the bone being sawed vertically through the middle of the scapuloclavicular articulation. The wound healed promptly, but within a week after the removal of the dressings a lump was discovered on the outer border of the scapula near the lower end of the cicatrix. Interscapulo-thoracic amputation with complete excision of the clavicle, as just described, was done at once. A liberal portion of integument over and about the growth was removed with it. Recovery was prompt

and evidently permanent, as the photograph herewith shown was made two and one-half years after the operation (Fig. 1).

CASE II.—Man, aged forty-eight. A pigmented mole at the back of his left shoulder became sore, and he consulted his physician, who at once excised it freely under local anaesthesia. It healed promptly. A few weeks later at the urgent solicitation of a friend, who had recently taken the agency of a life insurance company, he reluctantly consented to take a policy. The examiner passed him without objection, though the excision of the mole was mentioned. A few weeks later the axillary glands on the same side began to enlarge rapidly, and the scar became sore. He was brought to me for examination, and frozen sections of a piece of tissue removed from the scar showed melan sarcoma. The axillary glands at this time were the size of a man's fist. He complained of pain in his chest, but careful physical examination was negative. As the involved glands were in close proximity to the clavicle, it was decided to remove it entire in the interscapulothoracic amputation. His operative recovery was prompt. The photograph shown (Fig. 2) was made three weeks after the operation. The pain in his chest had increased. This may be seen in the facial expression. Two months later he died with an enormous metastasis in the liver.

CASE III.—Sarcoma of the arm following injury. This is the most rapid growth of sarcoma of traumatic origin that I have been able to find any record of. Cobb, quoted by Carson in the ANNALS OF SURGERY, June, 1913, mentions a case where local excision was done eight weeks after the injury, and this was followed by recurrence, which was then successfully circumvented by an interscapulothoracic amputation. Senn (*Tumors*, page 260) where radical operation was recommended ten weeks after fracture of the thigh. The abundant growth was discovered after the removal of the splints. Operation was refused, and the patient died from sarcoma. In this case, undoubtedly, the growth might have been evident several weeks earlier had it not been for the fracture dressings. In the case I am reporting the young man received a blow just above the inner side of the left elbow by the recoil of an automobile crank on the night of August 4, 1912. The blow was severe and painful, but he was

FIG. 1.

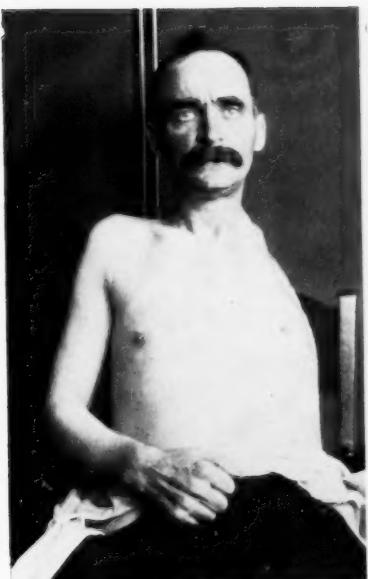


Case I.

FIG. 3.



FIG. 2.



Case II.

Case III.

Figs. 1-3.—Interscapulothoracic amputation.

FIG. 4.



Case IV.

FIG. 5.



Case IV.

able to resume his usual work the next day, and continued to drive an automobile truck for three weeks. Increasing stiffness of the arm, however, caused him to give up his work, and he went to the country. At this time a swelling of the anterior side of the arm began, and presently extended half way to the shoulder. He consulted a physician, who found bone deposits scattered throughout the enlargement, made a tentative diagnosis of sarcoma, and sent him in for further examination. Examination of the arm five weeks after the accident showed a hard enlargement of the anterior side of the arm firmly attached to the humerus, and extending from the elbow beyond the middle of the arm. A radiograph showed the shaft of the humerus intact, but scattered throughout the mass were irregular patches of bone. The elbow was flexed at a right angle, and permitted but a few degrees of motion. A consultation of surgeons was called, and the probability of sarcoma was agreed upon. It was also thought possible that a benign proliferation of bone tissue, myositis ossificans traumatica, throughout the adjacent muscle might have taken place. It was agreed to call in several consulting pathologists and to examine sections of the suspected tissue before proceeding to any radical operation. The frozen sections were prepared by a recent graduate of Harvard. The consulting pathologists were graduates of Johns Hopkins and the University of Pennsylvania. Their diagnosis of sarcoma was accepted by the consulting surgeons. The photograph shown (Fig. 3) was made 8 months after the operation.

CASE IV.—Girl, aged seven, in January began to have "growing pains" in the left arm. In March a swelling appeared at the upper part of the arm. In April a surgeon diagnosed sarcoma, and recommended amputation of the arm. This was refused, but a conservative operation consented to. The lump was removed and the bone scraped. Local recurrence was rapid. In June the child was taken to a cancer doctor, who applied caustic pastes, which produced a large eschar, which still remained on the growth at the time photograph (Fig. 4) was made, the day before my operation. The sarcoma, however, continued to grow below the eschar and the arm increased much in size. Interscapulothoracic amputation with complete excision of the clavicle was done. Fig. 5 is from a photograph made one week after the operation. The improve-

ment of the child's general condition in this short time was very marked. The growth presents a distinct reticulum of rather long cells sparsely enucleated. The alveolæ are filled with ovoid cells.

It is here proposed that complete excision of the clavicle in interscapulothoracic amputation of the shoulder, when done as described, presents but little, if any, greater danger or technical difficulty than the method of Berger, and that in at least a considerable proportion of cases this should be done to make the operation more radical.

# TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

*Stated Meeting, held at the New York Academy of Medicine,  
October 8, 1913.*

The President, DR. FREDERIC KAMMERER, in the Chair.

## POLCYTHÆMIA: HYPERNEPHROMA: NEPHRECTOMY.

DR. CLARENCE A. McWILLIAMS presented a man, fifty-nine years old, who was admitted to the Presbyterian Hospital on February 26, 1913, with the history of haematuria, of sudden onset and of five days' duration. He had first noticed only a drop of bright, red blood just at the end of urination, the urine both before and after this being clear. Two days later he passed several small strings, and three hours afterward, on attempting to urinate, he could pass only a few bloody clots, but no urine. He saw a physician, who catheterized him, affording him great relief. There was no history of increased frequency, pain, tenesmus nor loss of control.

The cystoscope showed a markedly trabeculated bladder, with no evidence of inflammation, neoplasm nor foreign body. There was moderate enlargement of the median lobe of the prostate, as well as of the anterior lobe. The ureteral orifices could not be located. An X-ray was negative. Palpation of the abdomen revealed a small, indistinct, non-tender mass, about the size of a plum, in the vicinity of the spleen. Otherwise the examination was negative. The urine contained a trace of albumin, with hyaline, granular and bloody casts and free blood; no pus. The blood-pressure ranged between 180 and 220 mm. An examination of the blood gave 8,800,000 red cells; haemoglobin, 110 per cent.; no myelocytes.

The patient, who at this time was under observation in the medical wards of the hospital, had some cyanosis of the hands

and lips. There was no history of headaches, syncope, dyspnoea, palpitation, precordial distress nor pain; no cough nor gastrointestinal symptoms; no epistaxis, haemoptyses nor haematemesis; no melæna nor nervous symptoms. He had never been jaundiced nor lost strength. The only symptom he complained of was haematuria.

An examination made at this time revealed a systolic murmur at the base and apex. The arteries were moderately thickened and there were many tortuous veins over various regions of the body. On the left side of the abdomen, just beneath the costal arch, was a mass extending downward for three inches, and at the costal margin projecting forward to the anterior axillary line. It was irregular in outline, firm to pressure and did not give rise to tenderness. The provisional diagnosis on the medical division was polycythæmia, with enlargement of the spleen, and cyanosis.

A cystoscopic examination made on March 11, 1913, revealed a worm-like cast of the ureter protruding from the left ureteral orifice. A phthalein test made immediately after this showed that 32 per cent. of the drug was excreted during the first hour and 10 per cent. in the second hour; 42 per cent. in two hours. Since the left ureter was plugged with a blood clot, it was argued, that the right kidney was doing all the work. A Wassermann test was made with negative results.

After inflation of the colon with air, the medical history stated that the evidence pointed to a tumor of the spleen, because there was no tympany in front of it. Subsequent operation showed that the tumor that had been made out was a large kidney, which did not allow the colon to pass in front of it because it filled up the entire space between the anterior and posterior abdominal walls and had pressed the colon inward. The medical men explained the haematuria as being a hemorrhage of the kidney due to polycythæmia, as bleeding often occurs in this condition, although hemorrhage from the kidney seems to be rare.

Dr. McWilliams said the case continued to excite much interest in the hospital, the medical men regarding the tumor as an enlarged spleen, while the surgeons were inclined to look upon it as a tumor of the kidney. At any rate, the surgeons maintained that an exploratory operation was advisable, and this was done by Dr. McWilliams on April 7. Upon opening the abdomen, the spleen was found to be small and pushed forward against the

diaphragm. The left kidney was easily enucleated together with its fatty capsule and removed, after separating and tying off the ureter.

Pathologically, the lesion proved to be a hypernephroma of the kidney, and an interesting feature of the specimen was that one branch of the renal vein was invaded by a pedunculated tumor mass, presenting from above, the free surface of this tumor being covered by a definite, unbroken capsule of connective tissue. It was found that the nephrectomy had been done wide of the tumor.

On the day following the operation, a blood count showed 686,400 red blood cells, with 85 per cent. of haemoglobin. The systolic blood-pressure at that time was 170 mm.; diastolic, 105 mm. The patient's recovery from the operation was uneventful.

Five months after operation the blood examination showed 8,200,000 red cells, and white blood cells 6,100. Phthalein test showed that the color appeared in the urine in 16 minutes; 39 per cent. was recovered in the first hour and 14 per cent. in the second hour, a total of 53 per cent. in 2 hours. The man was perfectly well, was working every day and there was no evidence of any recurrence which could be detected in any way.

DR. H. H. M. LYLE said Dr. McWilliams's case was a beautiful example of the fact that a hypernephroma might remain as a localized tumor for a considerable time and that dissemination took place by the way of the veins. Masses of hypernephromic tissue could be seen in the veins of the specimen. In the ordinary course of an operation it would be next to impossible to prevent the squeezing of such masses into the general circulation unless a preliminary ligation of vessels was made. For this reason Dr. Lyle is firmly convinced that the most important step in the whole operation is the ligation of the vessels as near to the mid-line as possible. In order to carry out this cardinal point a good exposure is necessary, and this can be obtained by the employment of the transverse incision or a modified Perthes.

DR. FRANK S. MATHEWS recalled a case where a man, twenty-four years old, complained of a persistent backache in the lumbar region, the pain being so severe that he gave up his work. There were no urinary symptoms whatever, and the case for a time was regarded as one of malingering. Subsequently, a small tumor was removed from the base of the neck and two pathologists, examining it independently, pronounced it a hypernephroma.

DR. WILLY MEYER said that about a year ago he removed a hypernephroma in a case where there was no history of haematuria, and a few days ago he saw an exactly similar case. These cases were of importance, because the diagnosis was usually based on the history of blood in the urine without pain, the symptomless haematuria.

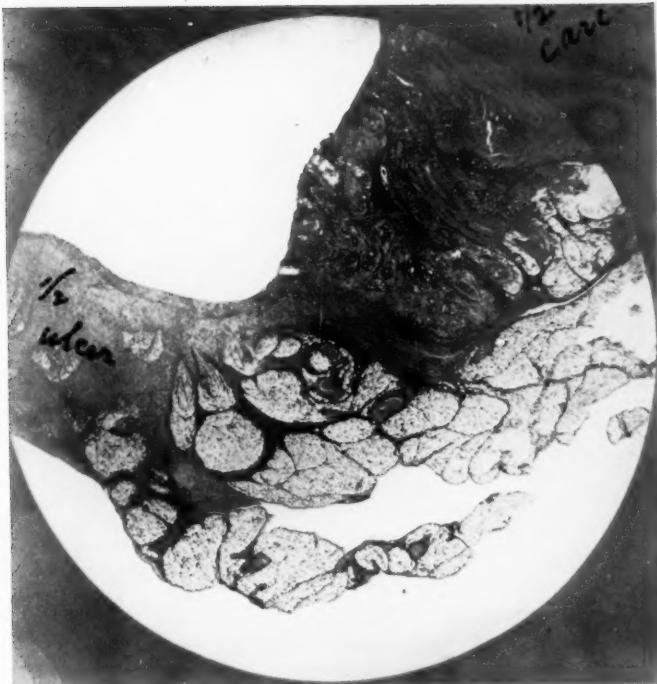
DR. N. W. GREEN said that two or three years ago, at the City Hospital, he was asked by the medical side to operate on a case of supposed empyema. He opened the pleural cavity and evacuated a quantity of turbid fluid which did not look like the ordinary pus of empyema. The patient gave no symptoms of urinary or abdominal trouble. Death occurred within a few days and the necropsy revealed a hypernephroma of both kidneys, with secondary deposits in the lungs.

DR. HOWARD LILIENTHAL said that one aspect of these cases had not been referred to, namely, the possibility of bone metastases. These, in his experience, were comparatively common, and in every case of haematuria of unknown origin coming under his observation he always examined the bones, especially those of the head, the sternum and the ribs. He could also recall cases where there were metastases in the long bones. The speaker emphasized the statement made by Dr. Meyer that blood in the urine, even in microscopic quantities, was not always found in hypernephroma. The tumor itself was usually very vascular before it broke down into the yellow honey-like variety, and ruptured on small provocation. He had seen, perhaps, half a dozen of these cases, and in one instance he was able to make the diagnosis of secondary hypernephroma from a deposit in one of the ribs.

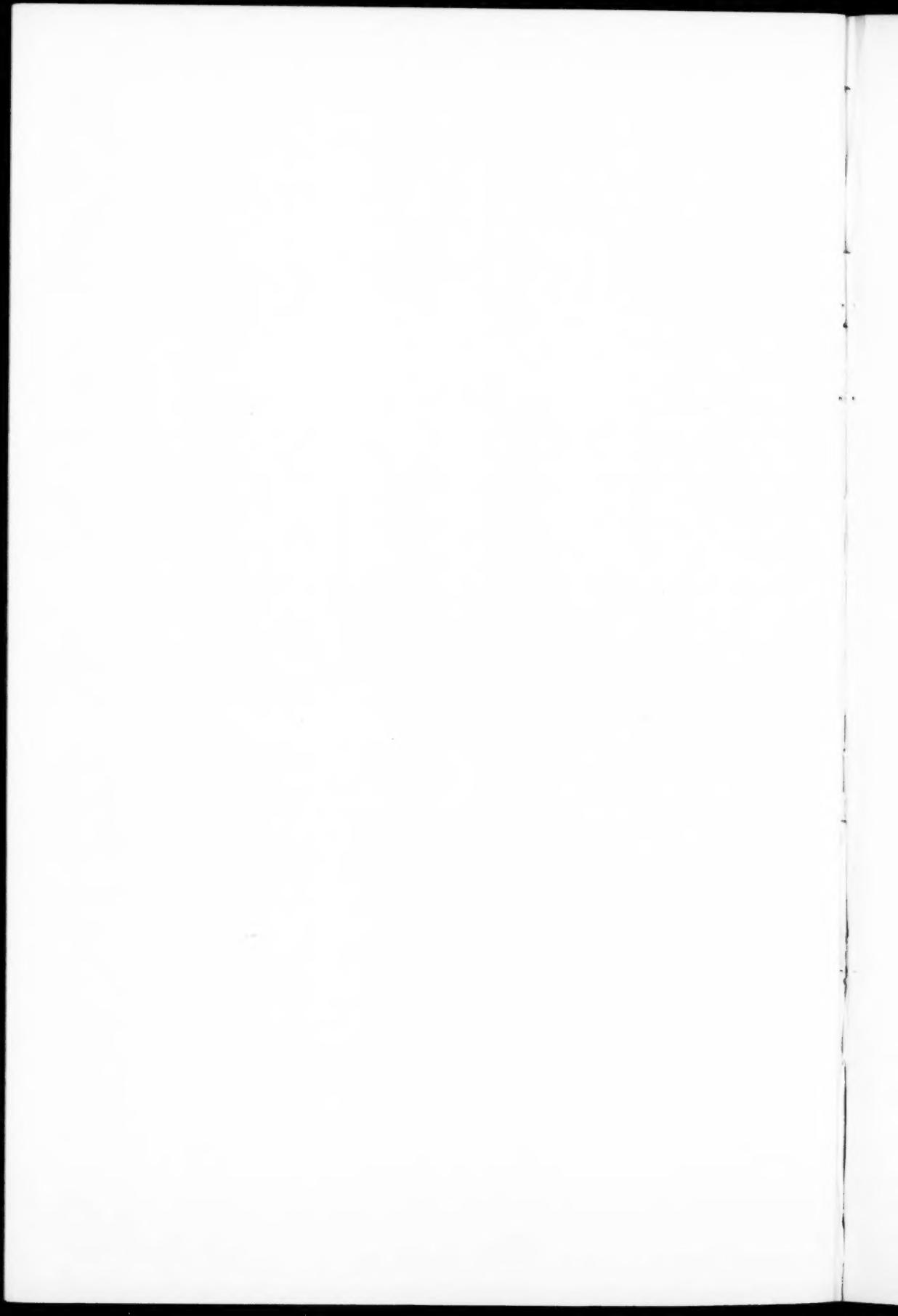
#### ULCER OF THE STOMACH, WITH MALIGNANT DEGENERATION.

DR. W. B. BRINSMADE, of Brooklyn, presented a man, forty years old, a machinist, who had an "ulcerated condition of the mouth and throat" as a child, supposed to have been contracted from being kissed. His nasal septum was removed when he was a child. He had jaundice and malaria while living in Brazil. Had a chancre and bubo twenty-five years ago, but no secondary manifestations of syphilis. He has been a heavy drinker and smoker. Wassermann reaction was negative.

FIG. I.



Ulcer of stomach with malignant degeneration.



About five years ago he began to have attacks of epigastric pain which were relieved by eating. Since then he gives the characteristic history of gastric ulcer, with increasing loss of weight and inability to work.

Upon operation, a very large ulcer was found on the posterior wall of the stomach, extending to the lesser curvature. There was also one enlarged, hard gland at the greater curvature. On March 19, 1913, a resection of the pylorus and about one-half of the stomach was done, the jejunum being united to the stomach about three inches from the cardia.

The patient made a good recovery and was discharged on April 4, his one complaint at the time being that his stomach seemed to hold very little. A microscopic examination of the excised gland showed it to be adenocarcinoma, as did also the margins of the indurated ulcer.

This case, Dr. Brinsmade said, was offered as an addition to the many proofs that ulcers of the stomach might degenerate and become malignant.

The microphotograph shows distinctly the crater of the ulcer with destruction of mucous membrane. The right side of the picture shows carcinoma (Fig. 1).

#### DUODENAL ULCER: POSTERIOR GASTRO-ENTEROSTOMY.

DR. BRINSMADE presented a man, thirty-five years old, who had been under treatment for five years for dyspepsia, giving the usual history of such cases. Upon operation, a rather large ulcer of the duodenum was found. Dr. Brinsmade did an ordinary posterior gastro-enterostomy, without closure of the duodenum, and the patient made a perfect recovery. Since the operation, which was done on the first of January, 1912, he had enjoyed excellent health and had gained over thirty pounds in weight.

#### PYLORECTOMY FOR RECURRENT GASTRIC ULCER.

DR. BRINSMADE presented a woman, thirty-three years old, who gave a history of having spent several months in bed, suffering from severe gastric symptoms, *i.e.*, pain, vomiting, with blood both in the vomitus and in the stools, and emaciation. Upon operation, an indurated ulcer, about the size of a silver dollar, was found on the anterior wall of the stomach. The appendix was found to be the seat of a chronic inflammation, and was removed.

The gastric ulcer was treated by inversion, thus cutting off its blood supply, and the patient made a very good recovery.

Following this operation, which was done in January, 1911, the patient gained 27 pounds in weight and returned to her vocation, which was that of a teacher. Soon afterwards, she again began to lose weight, and by the following January her gastric symptoms were as severe as they had been prior to the operation. Accordingly, on June 12, 1912, the stomach was again exposed, and a large indurated ulcer was found over the site where the original flat ulcer had been turned in.

A pylorectomy was done, with a wide margin, and a gastro-enterostomy completed the operation, from which the patient again made a good recovery. Last winter she again suffered from vomiting, but upon giving up her work the gastric symptoms gradually improved; she had gained seventeen pounds in weight and was now in excellent condition.

This case, the speaker said, was shown as an example of how a flat ulcer might become converted into an indurated ulcer in the course of one year.

Dr. Brinsmade also exhibited two X-ray plates of a case where he did a gastro-enterostomy fifteen months ago. The first picture was taken within five minutes of the bismuth meal and showed most of the meal in jejunum. The second picture was taken twenty minutes later and showed very active peristalsis. As shown by plates, the stoma in this case was patent. The patient's symptoms had not been much relieved by the operation, and the plates show the reason. This patient, however, has never been willing to act on advice in regard to eating and drinking and it is difficult to determine accurately whether the large patent stoma is the cause of his present discomfort or not.

#### POSTERIOR GASTRO-ENTEROSTOMY AND ENTERO-ENTEROSTOMY FOR DUODENAL ULCER WITH THE ELASTIC LIGATURE: CONDITION AFTER TEN YEARS.

DR. WILLY MEYER presented a male patient, seventy years old, who first came under his observation ten years ago with the history that eighteen or twenty years before that time—now almost thirty years ago—he began to suffer from severe and repeated hemorrhages from the bowels. These had since recurred intermittently, and had been especially severe during the previous

summer, while absent in Europe, so that when Dr. Meyer first saw him, upon his return to this country, he was very feeble and had lost much weight.

About that time, Dr. Meyer said, he had done a number of gastro-enterostomies with McGraw's elastic ligature with very favorable results, and he thereupon determined to follow that method in this case. During the early stage of the operation, the man had a sinking spell, from which he was revived with difficulty. The operation consisted of a posterior gastro-enterostomy with a No. 3 elastic ligature, long loop, and an additional enter-enterostomy, also made with the elastic ligature. The patient made such a good recovery that two months later he felt equal to attending a banquet and partake freely of all kinds of food, and since that time he had remained in good health. He was now a man of 70, weighing 190 pounds, which was a gain of 90 pounds since the date of the operation. In spite of his apparent good health, however, as far as gastric symptoms were concerned, he had on at least three occasions had tarry stools, the last one a year ago, but without pain.

#### PYLORIC EXCLUSION FOR DUODENAL ULCER: POSTERIOR GASTRO-ENTEROSTOMY.

DR. MEYER presented a man, thirty-one years old, who came under his care during the past summer through the courtesy of, and after he had been under treatment by Dr. Einhorn, who had made the diagnosis of ulcer of the duodenum. The patient also gave vague symptoms pointing to the gall-bladder.

On June 4, 1913, the abdomen was opened, and upon exposing first the appendix it was found to be much diseased and was removed. The gall-bladder was then exposed and was found to be free from stones and normal in appearance. After loosening the many firm adhesions, the pylorus was brought into view, and two ulcers of the duodenum were found, one near the pylorus, the other lower down. They were inverted by suture and a posterior gastro-enterostomy was done. The patient made a good recovery from the operation.

#### ULCER OF THE STOMACH TREATED BY DOUBLE LIGATURE.

DR. JOHN ROGERS presented a man, fifty-nine years old, who for 30 years had suffered from sour eructations, with gastric pain

and discomfort, from which he found relief by the use of bicarbonate of soda. An examination of the stomach secretions, made in March, 1913, showed a total acidity of 74, with free hydrochloric acid, 41, and manifest traces of blood.

Upon operation, which was done on March 29, an ulcer was found posteriorly at the upper end of the lesser curvature, its location being such that excision would prove extremely difficult. Dr. Rogers thereupon ligated the gastric artery close to the cœliac axis, applying a double ligature with the object of interrupting that part of the sympathetic nerve supply which accompanies the artery. The wound was then closed completely, nothing else being done. The patient made a good recovery; he was now entirely free from gastric distress and was able to eat anything. The total acidity had been reduced from 74 to 27, and the free hydrochloric acid from 41 to 20, no traces of blood. This was the result of an examination of the gastric secretions last April, and the last examination, made a few days ago, gave practically the same figures. The patient had gained steadily in health and strength and said he was now able to enjoy food from which he had been obliged to abstain since he was a boy. There are at present no symptoms and the patient considers himself entirely well.

DR. ROBERT T. MORRIS said he wished to speak of the advisability of inversion in the treatment of certain cases of ulcer. He had resorted to this method several times, both as a matter of choice and expediency, with very gratifying results. In one of his more recent cases the patient had first been operated on by Roux, who did his typical operation, and a year later he was again operated on by Dr. Cullen, of Johns Hopkins, who excised the pylorus. Subsequently, when Dr. Morris opened the abdomen, he found an ulcer situated at the margin of the jejunal opening. The condition of the patient was such that an excision was deemed inadvisable, and he simply inverted the ulcer, using Pagenstecher thread. In that case, the patient died a year later from another ulcer in the jejunum, and at the necropsy it was found that the previous ulcer that had been inverted, although still present, was not an active factor.

DR. ROGERS, speaking of the X-ray plates shown by Dr. Brinsmade, said it was formerly held that a large stoma was the safe thing to do in these cases, but as a matter of fact the gastro-

enterostomy opening could not completely close, and so far as he knew, it never did completely close. By leaving such a large stoma as was done in this case, it permitted the too rapid passage of the gastric contents before their proper digestion had occurred. The stoma should not be larger than the natural pyloric opening. The object of an artificial opening in cases of ulcer was to neutralize the gastric contents by a reflux of the duodenal contents, and if the opening was made too large, it immediately predisposed the patient to the formation of an intestinal ulcer by the too rapid discharge of the acid gastric contents.

DR. LILIENTHAL said that while he had never personally seen a stoma of this kind close, he saw a specimen demonstrated by Dr. Finney, of Baltimore, in a case in which a gastro-enterostomy had been done with the Murphy button. In that case, the opening that remained was barely large enough to permit the passage of a bristle. However, the speaker said he was convinced that the ordinary stoma made by suture was not very apt to close. Whether the trauma following the use of the button predisposed to such closure or not he did not know. Certainly in Dr. Finney's case the stoma had practically closed.

Speaking of the size of the opening, Dr. Lilenthal said that last summer he had an unfortunate experience where he thought that the fatal outcome was due to the fact that the stoma was too large. The patient developed a vicious circle and was not benefited by a subsequent operation. In a more recent case in which he operated he was very careful to avoid this error, making the opening just large enough to admit the tips of two fingers.

Dr. Lilenthal said that on previous occasions he had emphasized his opinion that pylorectomy should be done in two stages, especially if the patient was in a weakened condition. During the first stage (gastro-enterostomy) the operator could determine exactly what would have to be done, and at the end of two weeks, or perhaps three, the patient would be in a much safer condition for the second stage of the operation—the actual pylorectomy. To complete the operation at a single sitting occupied too much time, the shock was oftentimes too great, while an added disadvantage was that we often had to operate on tissues that were inflamed and, perhaps, with a perigastritis present.

DR. McWILLIAMS said that in a recent issue of *Surgery, Obstetrics and Gynecology* there was an article in which an author

attempted to refute the results of Cannon and Blake's experiments on dogs in connection with pylorectomy. Six cases of gastro-enterostomy were reported, in four of which it was shown that the gastro-enterostomy opening was patent, while in two of them the bismuth test showed that it passed through both openings. This author stated that proper drainage in gastro-enterostomy was secured by making the opening at the lowest portion of the stomach, and he maintained that Cannon and Blake's observations were erroneous when they said that a gastro-enterostomy did not afford drainage.

DR. GREEN said he took it for granted that the two-stage operation advised by Dr. Lilienthal did not apply to cases of acute perforating ulcer. The speaker said that during the last fifteen months he had seen four cases of acute perforating ulcer of the duodenum and one case of perforating gastric ulcer. In every one he did a posterior gastro-enterostomy after folding in the ulcer. All his cases recovered with the exception of one, where the perforation had taken place 27 hours before the patient came to the operating table.

DR. WILLY MEYER said that he also believed in the inversion of ulcers, and had done it wherever possible. In that connection he desired to call attention to a recent paper by Seidel, of Dresden, in which he showed that even in very badly infiltrated ulcers, by placing the sutures properly, the ulcer could be covered.

As to peptic ulcers, the speaker said he felt assured that the too rapid exit of the gastric contents into the duodenum would in a number of cases be the exciting cause of such ulcers. We should not place the gastro-enterostomy opening too close to the cardia, rather closer to the pylorus, and it should not be too large. In these cases he usually advised his patients to drink large quantities of a solution of bicarbonate of soda.

On the other hand, we should not make the opening too small. Personally, he had never seen such a stoma close if made with sutures, but he had seen it close after the use of the Murphy button, and others had reported a similar occurrence if the pylorus remained patent. In dealing with duodenal ulcers, he thought we should exclude the pylorus. The most radical method for this purpose was that of von Eiselsberg, transverse division of the stomach in front of the pylorus with stoma of either end. In this connection he would again call attention to the value of

the wire-stitching instrument of Hueltl as a rapid means of performing this operation. One method that had been suggested for effecting the exclusion of the pylorus was to strongly tie off the stomach very close to the pylorus with a silk thread, which of course would perforate later on, and place in the groove covering the thread a twisted cord-like piece of omentum, which was tightly wrapped around it, producing the exclusion by autoplasty, as we might term it. Dr. Charles Mayo had used the omentum minor for this purpose. Whatever the means adopted, the speaker thought that with the patient's permanent recovery in mind, exclusion of the pylorus after duodenal ulcer was important.

DR. A. V. S. LAMBERT reported a case where the patient, after a long-standing history of gastric disturbance, with pain and hemorrhage, had a gastro-enterostomy done in some western city. This benefited him for a year. He was a man of rather alcoholic tendencies, and a year after the operation he had a sudden attack of syncope, followed by tarry stools. This was followed for a month by bleeding, anaemia, and gastric pain, in spite of medical treatment. An X-ray was taken, which revealed a condition very similar to that shown in the plates demonstrated by Dr. Brinsmade. The X-ray also showed that some bismuth remained in the stomach as long as two hours after a test meal, and that the stoma though large was placed too far from the pylorus.

The patient stated that the original operation was for an indurated duodenal ulcer, and a year later, when the abdomen was opened, it was found that there was a jejunal ulcer alongside of a large stoma, several inches from the pylorus. They thereupon did a Finney operation on the pylorus, and the original gastro-enterostomy opening was left alone. That operation was done six months ago, and the patient had since remained free from hemorrhage and other symptoms. Repeated X-ray plates had shown that the stomach contents now passed almost exclusively through the pylorus, very little passing through the gastro-enterostomy stoma.

DR. KAMMERER, the president, said he had done von Eiselsberg's operation of exclusion five times in the last two years for duodenal ulcers. One case, which was operated on about three months ago, was a man of thirty in whom the speaker, on operation, found a large mass involving the pylorus and the beginning

of the duodenum, evidently an inflammatory deposit about a chronic ulcer. Several months prior to the operation the man had had a severe hemorrhage, and this was followed by another, equally severe, two months after the ulcer had been excluded. There were a few other similar cases on record.

His other cases, Dr. Kammerer said, had done exceedingly well. In some the operation dated back two years, and the patients had remained perfectly well, without any recurrence of their symptoms.

Dr. Kammerer said he could not entirely agree with Dr. Lilienthal that the two-stage operation was indicated in malignant tumor of the stomach. Personally, he had not been very fortunate in attempting to remove a malignant growth after doing a primary gastro-enterostomy, as he found, upon reopening the abdomen, that the tumor had become less movable than it was at the first operation. On one occasion he had been compelled to do a primary gastro-enterostomy and resect the pylorus afterward, owing to the extremely weak condition of his patient, but whenever possible he thought that the complete operation should be done at one sitting.

DR. BRINSMADE said that while on the subject of the inversion of gastric ulcers, he wished to call attention to the fact that the method was not always entirely satisfactory, as demonstrated by one of the cases he had shown at this meeting.

Speaking of the X-ray plates he had exhibited, Dr. Brinsmade said they were shown as evidence of an unsuccessful case, and were intended to illustrate the very point brought up by Dr. Rogers. The stoma was too large. It was made at the most dependent part of the stomach, and the plates showed its condition fifteen months after operation.

DR. LILIENTHAL said that what he had urged was not two operations, but a single operation in two stages, with an interim of perhaps two weeks between them. During the first stage he used no gauze; then there were no adhesions and the second stage was comparatively easy.

#### TUMOR OF THE CAROTID BODY.

DR. HOWARD LILIENTHAL presented a woman, sixty years old, who was first shown by him at a meeting of this Society in the spring of 1909. At that time she gave the history of having had

a small tumor in the side of the neck for thirty years. During the preceding five years it had increased considerably in size, and during the last year it had grown so rapidly that she became alarmed. The case was diagnosed as one of tumor of the carotid body, the diagnosis being based on the hardness of the growth, its location, the long history and the fact that the speaker had seen and operated upon a similar case some years before. That patient died about two years after the operation of a relapse, with cachexia, but with no evidences of a secondary or metastatic growth. The histological diagnosis in that case, as in the present one, was made in the laboratory of the Mt. Sinai Hospital.

The tumor in the present case was about the size of a hen's egg at the time of the first operation. It was firmly adherent to the internal jugular and to the carotid artery, so that it was necessary to ligate both of these vessels close to the clavicle, and employing them and the freed tumor as tractors, it was possible to shell out the pneumogastric nerve and ligate the external and internal carotid arteries and also the jugular vein in their upper portions, thus completely resecting them. On the day after the operation there was aphasia and well marked right hemiplegia. The left eyeball was soft, and its pupil contracted. In the course of a few days all of these symptoms excepting the contracted pupil had disappeared. The pupillary contraction was probably due to injury of the superior cervical sympathetic ganglion. The aphasia was central. There was no aphonia. In a case reported by Dr. John Chalmers DaCosta before the Philadelphia Academy of Surgery, on May 7, 1906, the diagnosis had also been made prior to operation. DaCosta, too, had been forced to resect the carotid and the deep jugular, and he described the operation as a very dangerous one. His patient was a man fifty-three years old, and after the operation, although there was no aphasia, the tumor being on the right side of the neck, there was hemiplegia, which was very slow to disappear. The carotid body, according to DaCosta, was first described by Mayer in 1833, though its existence was suspected by Haller; and Luschka, in the early sixties, made studies of the gland. It was not invariably present. It was a small gland, varying in size from that of a grain of rice to a grain of corn, and was intimately connected with the carotid at its bifurcation. It did not resemble a gland in structure, and contained many blood-vessels.

Histologically, tumors of the carotid body were similar to the endothelioma or perithelioma of the suprarenal. DaCosta stated that the apparent pulsation in these tumors was transmitted from the arteries. In the case shown, however, it appeared that the tumor itself undoubtedly pulsated. Dr. Lilienthal said he considered the case inoperable, and the patient now showed signs of cachexia. For the past three or four months she had been receiving frequent injections of absolute alcohol into the tumor, but without appreciable effect. Possibly, electrolytic puncture might help.

Dr. Lilienthal said that malignant tumors of this type, including the hypernephromas, appeared to him to strengthen the germ theory of ordinary cancer and sarcoma, the tumors under discussion being perhaps always congenital and remaining merely locally malignant unless actual transplantation should occur through the invasion of a blood-vessel. True metastases through lymph vessels and spaces, as observed in the usual malignant growths, was more likely to be the mode of extension of known bacterial infections.

DR. MORRIS said that endothelioma gave a rather ready response to radium and the X-ray. In one case where he did a gastro-enterostomy to relieve the obstruction caused by a tumor of the pylorus, a section of the growth was taken, which showed it to be an endothelioma. The patient was subsequently X-rayed by Dr. Aspinwall Judd, and under the influence of the rays the tumor disappeared. Whether there was a later recurrence or not Dr. Morris was unable to say, as the patient was lost sight of.

#### GASTRIC NEUROSIS, WITH X-RAY FINDINGS SIMULATING CARCINOMA.

DR. OTTO G. T. KILIANI showed a number of X-ray plates which had led to the mistaken diagnosis of carcinoma of the stomach. The case was that of a woman, twenty-three years old, who gave a history of gastric disturbance dating back four years, the symptoms consisting of discomfort after eating, nausea, headache, and vertigo. Chemical analysis of the gastric contents showed nothing definite. The case was looked upon as one of gastric neurosis, but as a precautionary measure, a series of radiographs were taken, and in these the contour of the stomach had the typical appearance of a carcinoma of the larger curvature.

Influenced by these findings, the stomach was exposed and carefully examined, and was found to be perfectly normal.

Dr. Kiliani said the only explanation he had to offer for the Roentgen findings which both by himself and by a skilled radiographer were regarded as typical of carcinoma of the stomach, was that this patient was suffering from a gastric neurosis with the production of a large amount of mucus, which prevented the bismuth from coming in contact with the edge of the curvature, and gave a deceptive gastric outline.

DR. ARTHUR L. FISK said that the case reported by Dr. Kiliani demonstrated the necessity of not giving too great weight to any one sign but that all the symptoms considered together should determine the probable condition.

Tumors when present are generally palpable and obstructive, and food remnants are found in the stomach; if the growth is cancerous there is diminished total acidity, also the free hydrochloric acid is less.

If the symptoms do not correspond with the X-ray findings, the accuracy of these should be questioned.

A logical and judicial consideration of the signs and the symptoms should result in accurate diagnosis.

# TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

*Stated meeting, held October 6, 1913.*

DR. G. G. DAVIS, President, in the Chair.

## BONE GRAFTING FOR POTT'S DISEASE.

DR. WALTER G. ELMER called attention to the operation of bone grafting for Pott's disease. He said that great credit is due to the originator of this operation, who utilized the spinous processes of the vertebrae as bone grafts from which a firm bridge of new bone was built up, spanning the area of disease and holding the spine rigid. In doing this, the spinous processes are denuded of their periosteum, cut off at their bases and placed like the links of a chain along the tops of the arches. A subsequent operation was suggested which leaves the spinous processes intact, a bone graft from the tibia being inserted in their tips which are split to receive it.

Tuberculosis of the body of a vertebra is a disease which, if untreated, progresses toward destruction of the vertebral body. Even when proper treatment is instituted the disease progresses beyond that time—gradually losing its activity until finally arrested; then the process of repair begins. It may be likened to a ball rolling down an inclined plane—gathering momentum as it descends—and then out onto a level surface, when the momentum is gradually lost and its motion is finally arrested; so with the disease. The level surface is reached at the moment the child's spine is put at rest, but the disease continues to progress to a point considerably beyond this.

An operation therefore which immobilizes the spine and actually adds to its natural strength would appear to be a wise surgical procedure. The new bone which is formed spreads out in a broad compact mass upon the transverse processes and unites the spinous processes.

The new bone grows but if it does not keep pace with the

natural healthy bone of the spine it must exert a corrective influence upon the developing kyphosis.

An operation of this character, requiring, perhaps, forty minutes to perform, and not always upon the most favorable class of patients, must have a mortality. Just what the mortality is cannot be stated. If it should prove to be greater than one per cent. it would make one hesitate to recommend the operation. The operation, however, shortens the treatment and hastens the cure, and must save certain patients that would otherwise progress unfavorably.

A considerable number of patients have now been operated upon in the Orthopædic Department of the University of Pennsylvania—both operations have been employed—every region of the spine has been operated upon—the patients have been children and adults, chiefly children, of course—and in every instance the patients, apparently, have been distinctly benefited.

A support is usually worn for six months after the operation. During the latter part of this period the plaster jacket is discarded and a simple back board of plaster held in place with adhesive straps, or some similar appliance is used.

Dr. Elmer presented two children who had been treated in the Orthopædic Department of the University of Pennsylvania and through the courtesy of Dr. G. G. Davis were now shown.

CASE I.—A boy who had developed a slight kyphosis in the upper lumbar region when brought to the hospital nearly two years ago. He is one of the early cases operated upon. Now a broad compact mass of bone spreads far out on the transverse processes. All other parts of the spine are freely mobile and it flexes readily as he stoops to pick up an object. He walks naturally and is in perfect health so far as one can tell and has been cured for about a year and a half.

CASE II.—A little girl, one of the more recent cases, in which case the feature worth mentioning is the improved line of the spine. No kyphosis can now be seen. Tracings which were made with the lead strip when she was being treated with plaster jackets show quite a little kyphosis in the lower dorsal region—a comparison of those with a tracing made a short time ago shows the difference—this last one shows no kyphosis. The child is strong and healthy and growing, and it is not unlikely that the spine in growing is becoming straighter. She has worn no sup-

port for about two months. Both these children had the bone graft taken from the leg.

#### TUBERCULOSIS OF KNEE.

DR. ELMER presented a little girl to illustrate the favorable outcome of what promised to be a very discouraging case. Four years ago she was injured and was treated by her physician for tuberculosis of the knee. About eight months later she was admitted to the Jewish Hospital. There was then a discharging sinus above the outer condyle of the femur. A tubercular osteomyelitis involved the epiphysis and lower portion of the diaphysis. The bone was opened on the side and the diseased part cut away and curetted out—leaving a shell of bone. She was treated in bed for three weeks—then sent home wearing a fenestrated plaster cast, high shoe and crutches. She was injured later on by one of her playmates, and the disease then invaded the knee-joint which became distended with tubercular pus. She was readmitted to the hospital, the joint opened on both sides and drained, and then followed a long course of treatment.

She was kept on crutches and in plaster for one year, then a Thomas knee-brace, then plaster of Paris and the child walking on the limb.

The sinus closed last January. She has worn no support for eight months. She now walks quite naturally and with free and normal motion in the knee-joint and appears to be in the best of health.

DR. GWILYM G. DAVIS queried as to whether the results in cases of bone grafting for tuberculosis of the spine will be permanent. He had recently seen a skiagraph of a case which had been done over a year ago and it showed a distinct shadow of bone lengthwise in the position of the curve; whether this was the original or new bone he could not say, but at any rate there was bone there. The question may be raised as to whether the fixation will remain. The later history of cases, two or three years after the operation, should be known, as to the permanency of the union.

#### BILATERAL TEMPOROMAXILLARY ANKYLOSIS.

DR. JOHN H. JOPSON presented a woman, aged twenty, who applied for treatment at the Polyclinic Hospital for an ankylosis of the jaws which was of three years' duration. It began as

an arthritis in the course of an illness of acute onset attended by inflammation of most of the joints, including the interphalangeal joints, ankles, knees and elbows. She was bedridden for several months, the polyarthritis lasted a year and a half, was attended by contractures of the arms and legs and finally ended in recovery, except for the persistent ankylosis of the jaws and the lumbar spine.

She has a bony thickening over the lumbar vertebræ with fixation in that region and at one time this locality was the site of considerable pain. She wore a spine-brace for a year but later discarded it. The only disability of which she now complains is the fixation of the jaw.

Examination showed practically complete ankylosis of both temporomaxillary joints with no lateral motion present, and only about one-eighth inch of motion upward and downward, which was practically due to springing of the bone. There was an interval of one-sixth inch between the incisors, the lower being a little behind the upper, and the molars were in contact. She could eat only by breaking or cutting her food into small particles and tucking it into her mouth with her fingers.

An attempt was first made to separate the jaws by means of wooden wedges under general anaesthesia, but nothing was accomplished. Three weeks later Lilienthal's operation was carried out on both sides. Ether anaesthesia, and the preliminary hypodermic administration of morphia to prevent vomiting, were used.

After turning down the zygoma, excellent exposure of the temporomaxillary joint was obtained on either side, and firm bony ankylosis was found to be present. The hammer and chisel were used to cut away the condyles and the neck of the bone. No unlocking of the jaws could be obtained until the second joint had been excised when free opening was permitted. A flap from the temporal fascia was turned back into the joint on each side and sutured between the bones, after which the resected portion of zygoma was replaced and held by periosteal suture.

The patient made a good recovery, although there was slight superficial infection on each side. She moved her jaws well after a few days, and was put on solid diet at the end of a week. It was not found necessary to keep anything between the teeth at any time. She ate an apple twelve days after operation by biting into it, and said she could have done so sooner. When discharged

from the hospital she had a possible separation of seven-eighths of an inch between the incisors, with a strong bite, and good rotary and grinding movement.

Her general nutrition has rapidly improved. She has gained more than 20 pounds, and eats everything.

The advantages of the method of approach in this operation as described by Lilienthal (*ANNALS OF SURGERY*, August, 1911) include a good and easy exposure of the joint and the absence of any danger of injury to the facial nerve.

Dr. Lilienthal has reported four cases, three of them operated upon with perfect success, and the fourth still under treatment.

There is some risk of slight infection which may come from the traumatism of the operation, and possibly through the salivary duct and the parotid.

The method consists of making an incision along the zygoma, beginning just in front of the auricle, carried down to the periosteum. At right angles from this, a second incision runs downward in front of the ear for a distance of an inch and a half and divides only the skin. The triangular flap so outlined is dissected downward and forward. The zygoma is divided by carrying a fine Gigli saw around it in two places, after which it is turned down with the masseter muscle and soft parts attached, including a portion of the parotid gland, and fibres of the facial nerves.

When bony ankylosis exists the condyles and the neck on each side are removed with gouge and curette or with hammer and chisel. Arthroplasty is completed by turning in a flap of temporal fascia.

It is usually advisable to operate on both sides at once when unilateral excision will not unlock the jaws, as a two stage operation doubles the danger from ether vomiting which is always present, and which might result fatally. Lilienthal recommends preliminary starvation and morphia half an hour before beginning the ether,—the preparation which proved successful in this case.

#### UNUNITED FRACTURE OF THE NECK OF THE FEMUR.

DR. JOHN H. JOPSON presented a colored man, aged fifty-one, who slipped and fell on a level floor, October, 1912. He was unable to stand or walk; was taken to a rural hospital where he remained

for five days, and was then brought to his home in Philadelphia. He received no treatment, but after several months presented himself at the Polyclinic Hospital, disabled and unable to walk without assistance. Examination showed an ununited fracture of the neck of the right femur, with a considerable amount of callus around the fracture and three-fourths of an inch shortening.

An open operation was performed through an anterior incision, the joint opened, a large amount of synovial fluid under tension evacuated, the fractured surfaces freshened and a  $2\frac{1}{2}$  inch screw introduced through the great trochanter into the head of the bone.

Primary union was obtained. He now has what appears to be good bony union with an inch and a half shortening and a good functional result. He still uses one cane in walking, but is doing a little light work.

#### ILEOSIGMOIDOSTOMY (LANE).

DR. JOHN H. JOPSON presented a man, aged thirty-eight, who had suffered for 17 years with abdominal pain and constipation. Illness began rather acutely with what was diagnosed as inflammation of the bowels. Pain increased in severity and six years ago his appendix was removed. He was relieved for a time, relapsed again and in the Spring of 1912, Dr. Jopson operated and found adhesions, perigastric, periduodenal, and generalized throughout the abdomen. Extensive division of adhesions was followed by temporary improvement lasting for eight months, when he again relapsed, and reapplied for treatment in June of 1913. He was obstinately constipated, complained of constant pain in the hypogastric region, and was unable to work at his trade as a paper-hanger.

He was again operated upon in the end of June. Marked perigastritis and pericolitis were present. The small intestines were practically free of disease, their peritoneal coat being in striking contrast to that of the large bowel and stomach. The stomach was much distended.

An ileosigmoidostomy was made according to Lane's technic, except that the anastomosis was made as high in the sigmoid as possible. The colon was not removed. He remained in the hospital about four weeks. He returned to his work a month later greatly improved, and since then he has gained many pounds

in weight. The pains have disappeared and constipation has been much improved. He usually has two or three liquid movements a day, sometimes finding it necessary to use a mild laxative. He considers himself relieved of most of his old symptoms.

#### THE RELATION OF POSTERIOR SUBLUXATION OF THE SHOULDER-JOINT TO OBSTETRICAL PALSY OF UPPER EXTREMITY.

DR. T. TURNER THOMAS read a paper with the above title for which see the February issue of the ANNALS OF SURGERY.

DR. ASTLEY P. C. ASHHURST said that he had recently seen at the Episcopal Hospital a child of two years or thereabouts, who had been injured in birth; there was complete flaccid palsy of the upper extremity, and *complete loss of sensation* in the limb, and this had persisted unchanged since birth. This child will chew its own fingers, frequently injuring them in this way, and sometimes burning or scalding them.

Again he had recently operated, at the Episcopal Hospital, on a boy of twelve years who presented partial flaccid paralysis of the upper extremity due to injury at birth, the shoulder-joint was almost flail-like, and if his arm happened to get into the position of extension (behind the patient's body), the head of the humerus became subluxated anteriorly, caused him pain, and he had to pull this arm forward with the other hand. There was also persisting paresis of the muscles supplied by the radial nerve. There was no posterior subluxation of the head of the humerus.

Another case was that of a baby with typical "obstetrical palsy" of the arm sent from Dr. Harte's service in the Orthopaedic Hospital to the nervous department for examination. Dr. Boyer found reactions of degeneration present, but on account of the extreme youth of the patient it was not possible to determine very accurately which muscles were at fault.

Last winter he saw, at the Episcopal Hospital, two brothers (one about twelve years old, the other about seven years) who had been similarly injured in birth. In both patients there was distinct posterior subluxation of the shoulder, and the head of the humerus could be felt back of the acromion. Typical paralysis was present, but great improvement had occurred since birth.

Last winter he saw at the Orthopaedic Hospital a baby only a few weeks old, who had been injured in birth, by attempted but

unsuccessful version. When born the arm was held across the front of the neck, with the elbow highly elevated, the forearm fully pronated, and the palm of the hand looking forward, and being in a position above the opposite shoulder. The limb rebounded to this position when attempts were made to bring it down. The head of the humerus was clearly palpable beneath the spine of the scapula, and in the axilla was a bony prominence, probably the glenoid or coracoid. There was practically complete paralysis. The mother was directed to manipulate the arm daily, and she brought the patient back for observation at frequent intervals at first. The child is now nine months old. Now the head of the humerus stays in the glenoid, and can be felt projecting forward in front of the acromion as is normal; it is not palpable beneath the spine. Great improvement has occurred in the paralysis, and is continuing; only recently there has returned very slight power of extension of the wrist and fingers. Otherwise there is complete paralysis of the musculospiral nerve.

Dr. Ashurst remarked that it has been maintained by Duval and Quillain (*Arch. Gén. de Méd.*, 1898) that there are no such clinical entities as paralyses due to lesions of the brachial plexus, only two types existing, radicular and terminal, affecting either the spinal motor roots or the nerve trunks below the plexus. It appears to be the contention of Dr. Thomas that nerve lesions of any kind are of extreme rarity, and if not altogether hypothetical at least are secondary in causation and importance to lesions of the shoulder-joint.

The cases he had now cited seemed to him to demonstrate: First, that pure nerve lesions occur (Cases I and II) and may be of much greater importance than any injury to the shoulder-joint even if this is present (Cases III and V); and second, that, as Dr. Thomas has pointed out, posterior subluxation of the humerus is a frequent lesion, often overlooked and perhaps may be the cause of persistence of paralysis (Case IV).

There can be little doubt that surgeons who see many of these cases will have their interest stimulated in the pathogenesis and treatment of the lesions by this further very important contribution made by Dr. Thomas to the surgery of the shoulder-joint.

DR. THOMAS, in closing, said that he did not mean to say that none of these cases of birth palsy were due to rupture of the

brachial plexus but he believed that none of his twelve cases were. He thought it fair to say that most cases are not. There was no doubt in his mind about rupture of the nerves in Boyer's case.

With regard to anterior luxations at birth, he had not seen them. The only autopsy report of a congenital anterior luxation of the shoulder-joint which Stimson could find is one reported in Stimson's book, observed in 1847 by Smith, which was a double anterior dislocation. Stimson concluded that Smith did not have a congenital dislocation in this case, and after reading Smith's report he would agree with Stimson.

#### CANCER AND PRECANCEROUS CONDITIONS.

DR. WILLIAM L. RODMAN read the Annual Oration for 1913 on the above subject, for which see page 47.

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#### TO CONTRIBUTORS AND SUBSCRIBERS:

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ANNALS OF SURGERY,  
227-231 South Sixth Street,  
Philadelphia.